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Everton

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(45) **Date of Patent: Jan. 2, 2018**

(54) **METHOD AND SYSTEM FOR EMAIL DISAMBIGUATION**

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(72) Inventor: **Paul Everton**, Chicago, IL (US)

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(21) Appl. No.: **15/378,259**

(22) Filed: **Dec. 14, 2016**

Related U.S. Application Data

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(51) **Int. Cl.**
G06F 15/16 (2006.01)
H04L 12/58 (2006.01)
H04L 29/08 (2006.01)

(52) **U.S. Cl.**
CPC ***H04L 51/12*** (2013.01); ***H04L 51/08*** (2013.01); ***H04L 51/10*** (2013.01); ***H04L 67/02*** (2013.01)

(58) **Field of Classification Search**
USPC 709/206
See application file for complete search history.

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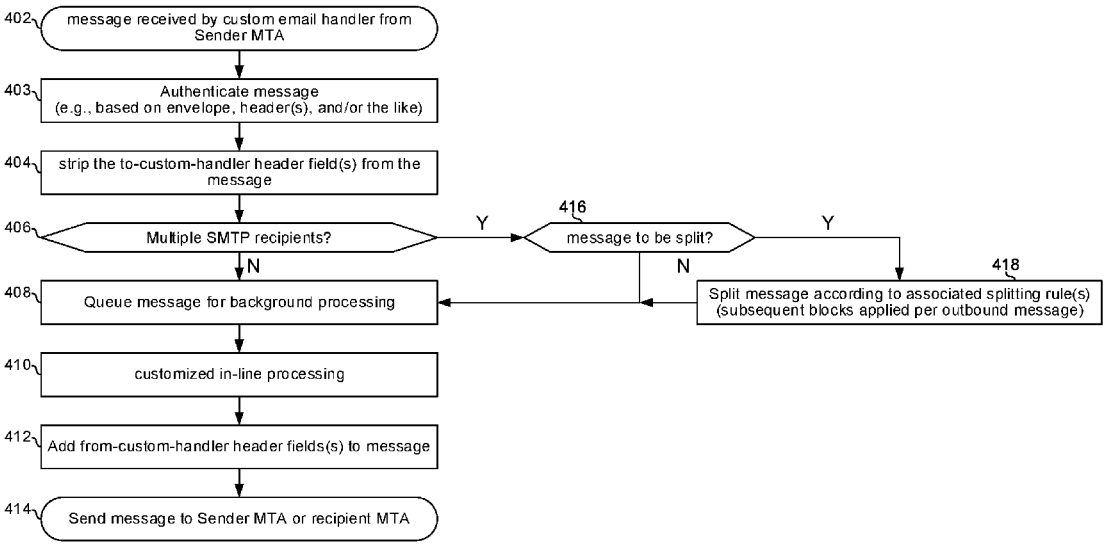
Primary Examiner — Alicia Baturay

(57) **ABSTRACT**

A system comprises email processing circuitry and network interface circuitry. The email processing circuitry is operable to receive an email message to be sent by the email processing circuitry using simple mail transfer protocol (SMTP). The email processing circuitry is operable to parse the inbound email message. The email processing circuitry is operable to, in response to detecting that the inbound email message is intended for multiple recipients and comprises the particular custom processing rule in its header fields and/or message body, parse the inbound email message into the multiple outbound email messages, where each of the outbound email messages has a different SMTP envelope. The network interface circuitry is operable to send the multiple outbound email messages into a network using SMTP.

14 Claims, 35 Drawing Sheets



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2006/0031352	A1 *	2/2006	Marston	H04L 67/22 709/206
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2015/0058429	A1 *	2/2015	Liu	H04L 51/34 709/206
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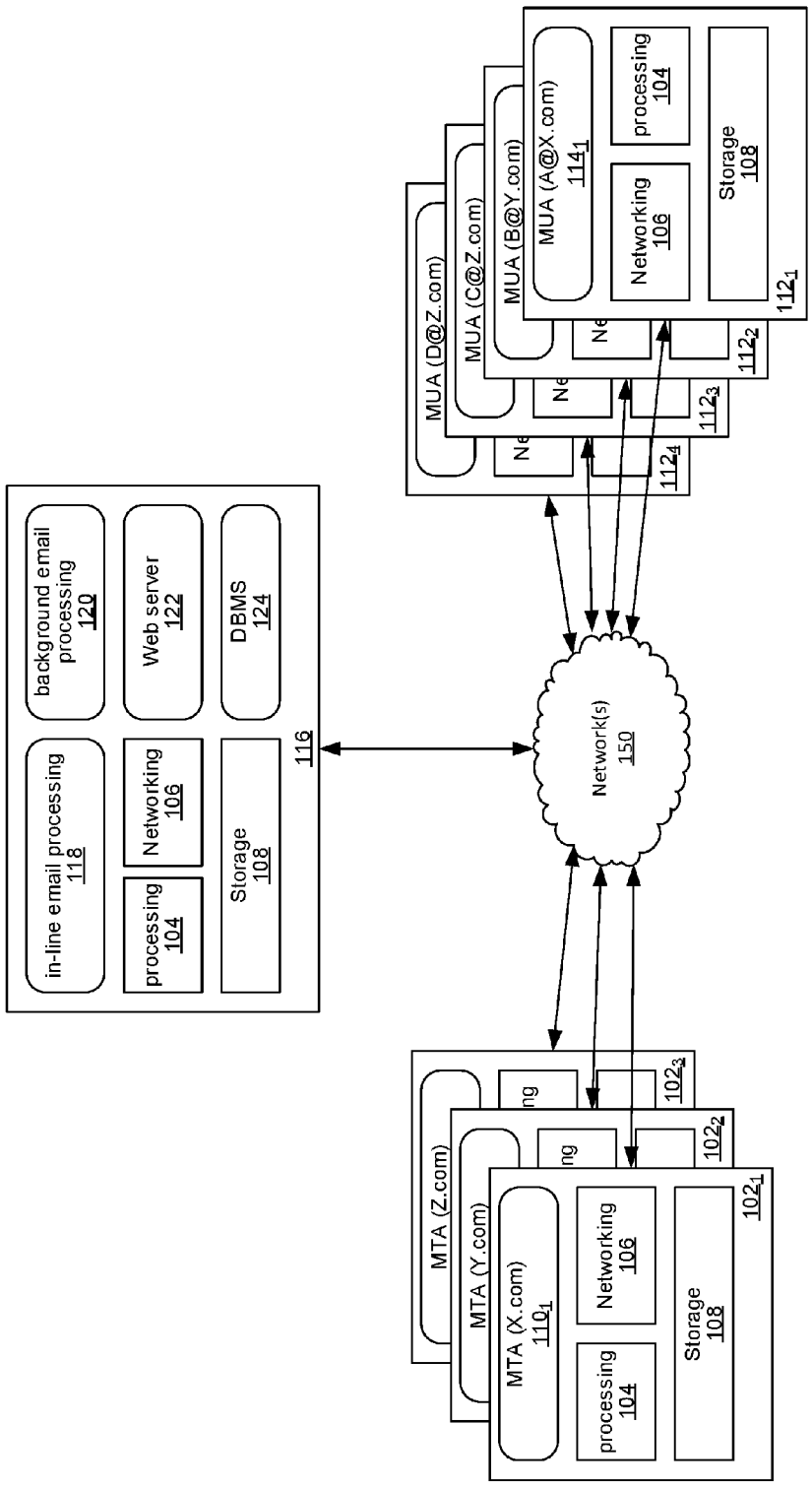
MTA (Z.com)
MTA (Y.com)
MTA (X.com) 110₁
processing 104
Networking 106
Storage 108
102₁
102₂
102₃
Network(s) 150
116
in-line email processing 118
background email processing 120
Web server 122
DBMS 124
processing 104
Networking 106
Storage 108
MUA (D@Z.com)
MUA (C@Z.com)
MUA (B@Y.com)
MUA (A@X.com) 114₁
processing 104
Networking 106
Storage 108
112₁
112₂
112₃
112₄

FIG. 1

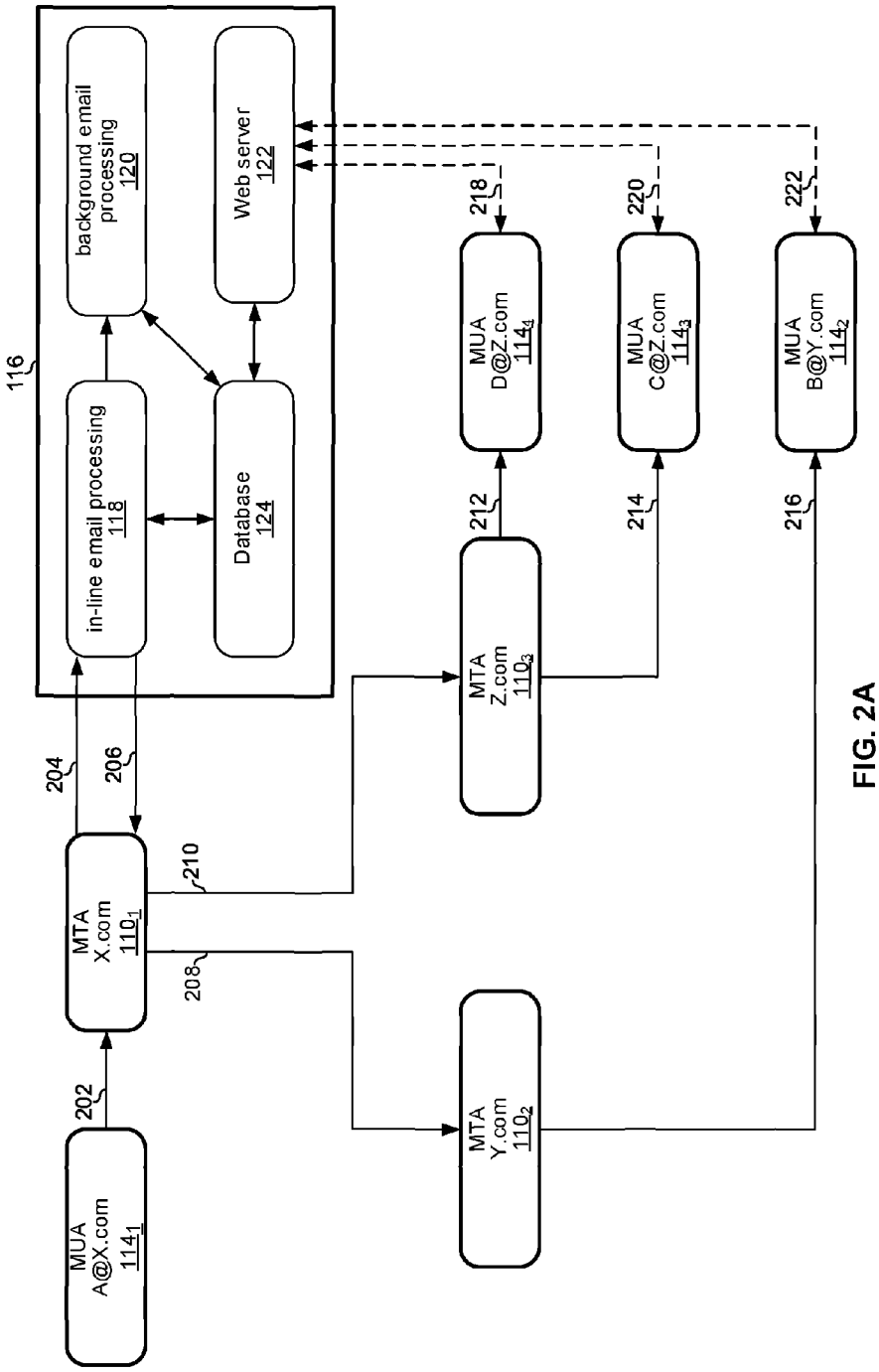
116
background email processing 120
Web server 122
in-line email processing 118
Database 124
MUA A@X.com 114₁
MTA X.com 110₁
MTA Y.com 110₂
MTA Z.com 110₃
MUA D@Z.com 114₄
MUA C@Z.com 114₃
MUA B@Y.com 114₂
202
204
206
208
210
212
214
216
218
220
222

FIG. 2A

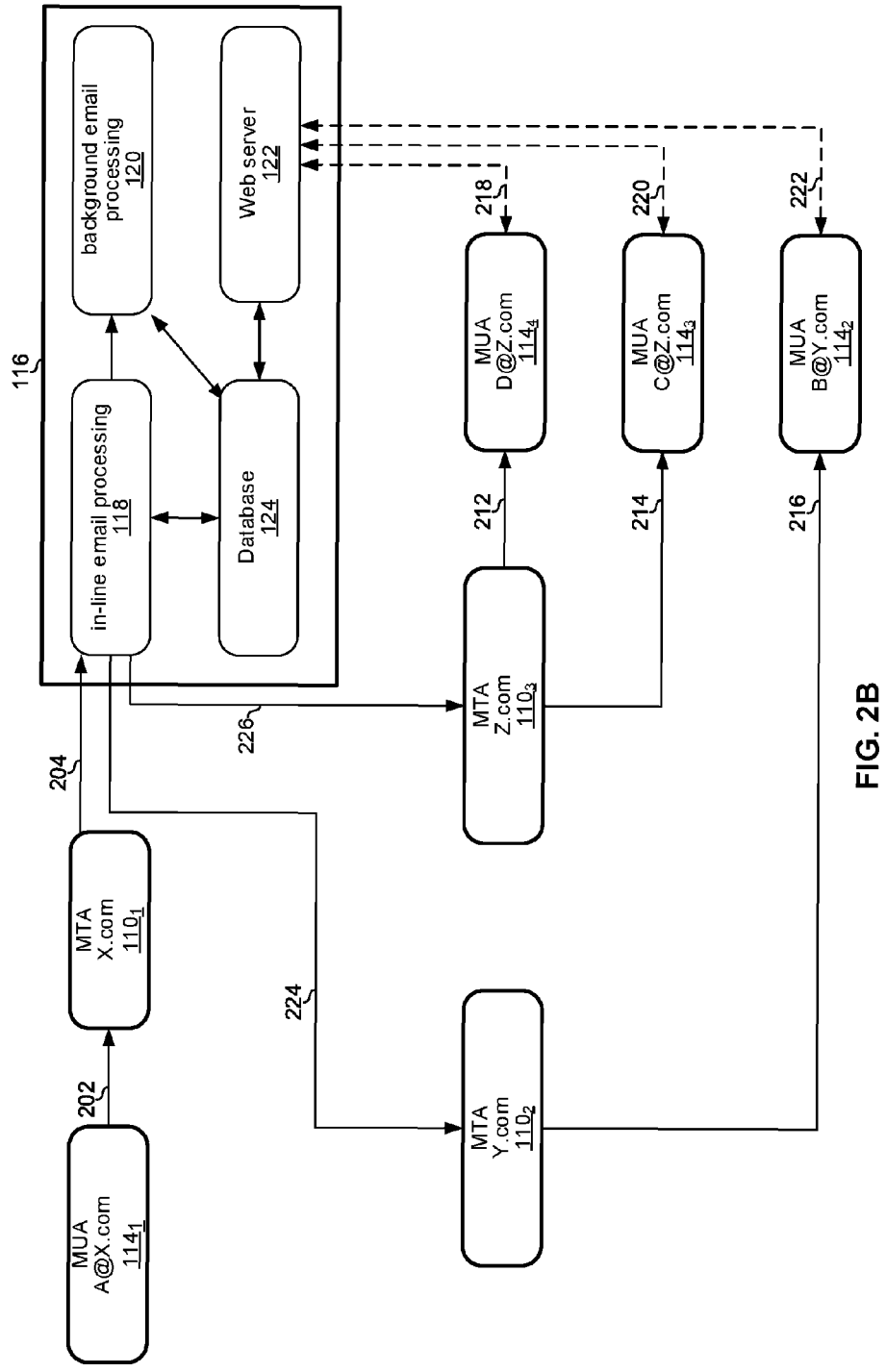
MUA A@X.com 114₁
202
MTA X.com 110₁
204
116
background email processing 120
Web server 122
in-line email processing 118
Database 124
226
MTA Z.com 110₃
212
214
216
MUA D@Z.com 114₄
MUA C@Z.com 114₃
MUA B@Y.com 114₂
218
220
222
224
MTA Y.com 110₂

FIG. 2B

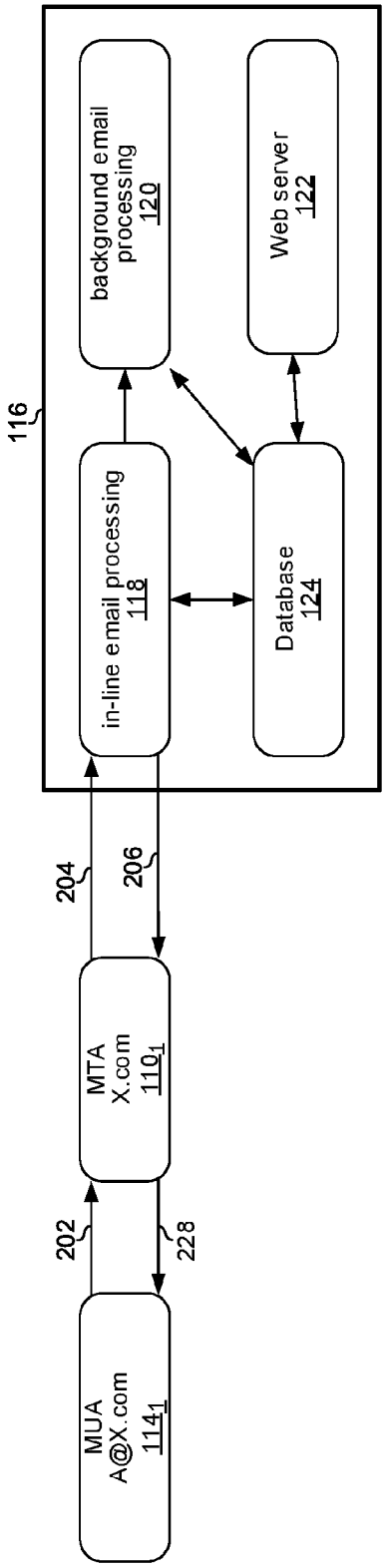
116
background email processing 120
Web server 122
in-line email processing 118
Database 124
204
206
MTA X.com 110$_1$
202
228
MUA A@X.com 114$_1$

FIG. 2C

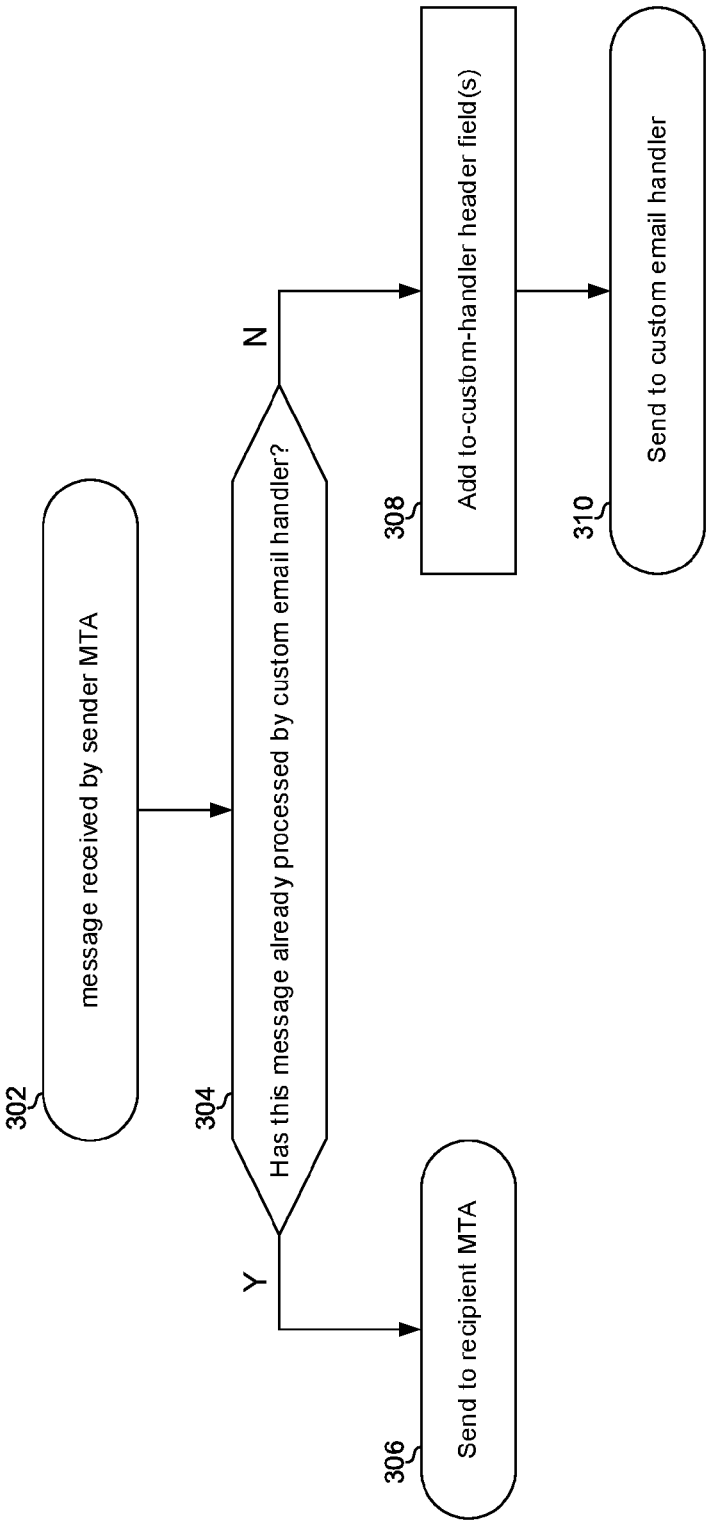
message received by sender MTA
302
Has this message already processed by custom email handler?
304
N
Y
Add to-custom-handler header field(s)
308
Send to custom email handler
310
Send to recipient MTA
306

FIG. 3

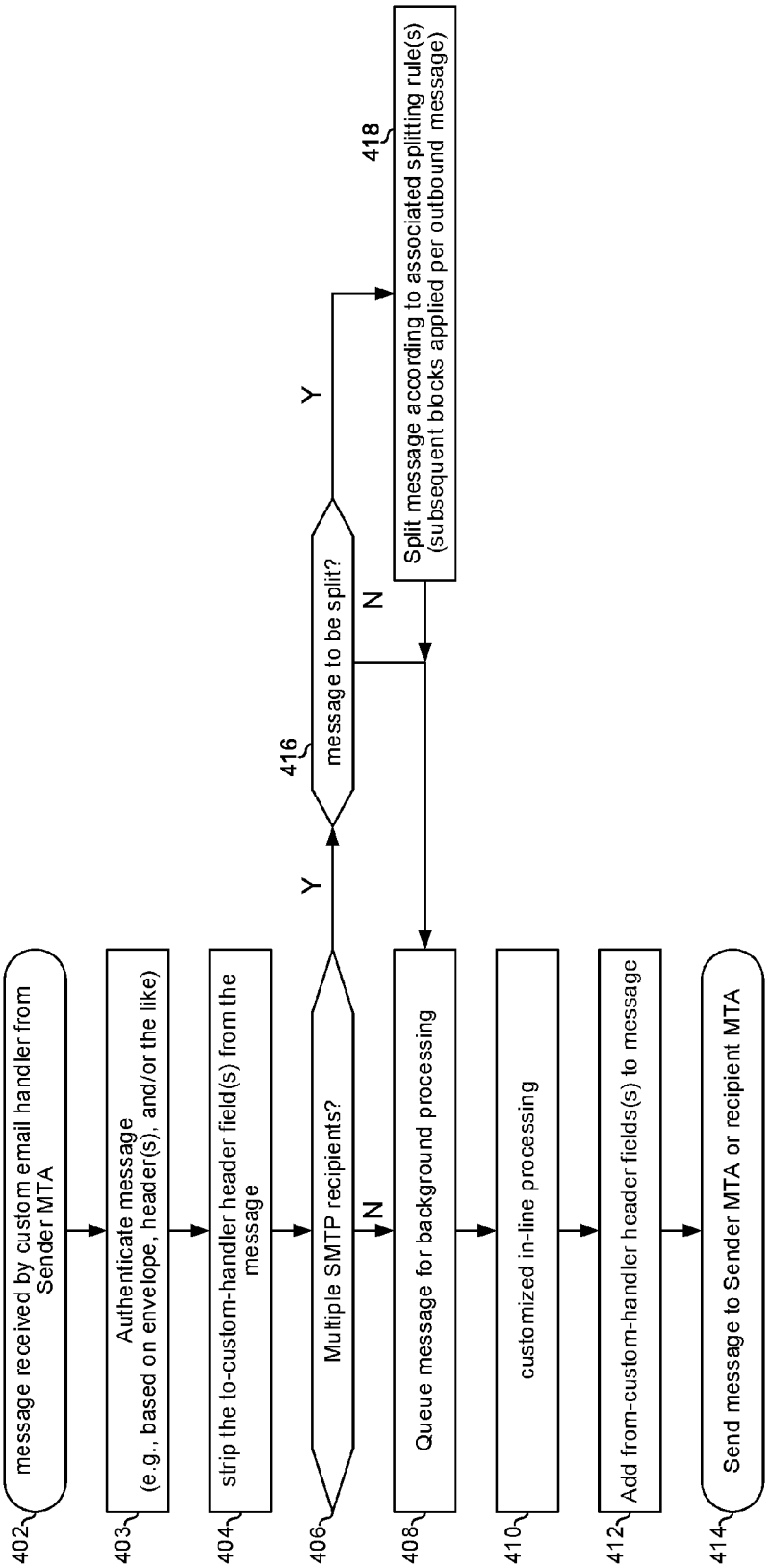
message received by custom email handler from Sender MTA
402
Authenticate message (e.g., based on envelope, header(s), and/or the like)
403
strip the to-custom-handler header field(s) from the message
404
Multiple SMTP recipients?
406
Y
N
message to be split?
416
Y
N
Split message according to associated splitting rule(s) (subsequent blocks applied per outbound message)
418
Queue message for background processing
408
customized in-line processing
410
Add from-custom-handler header fields(s) to message
412
Send message to Sender MTA or recipient MTA
414

FIG. 4A

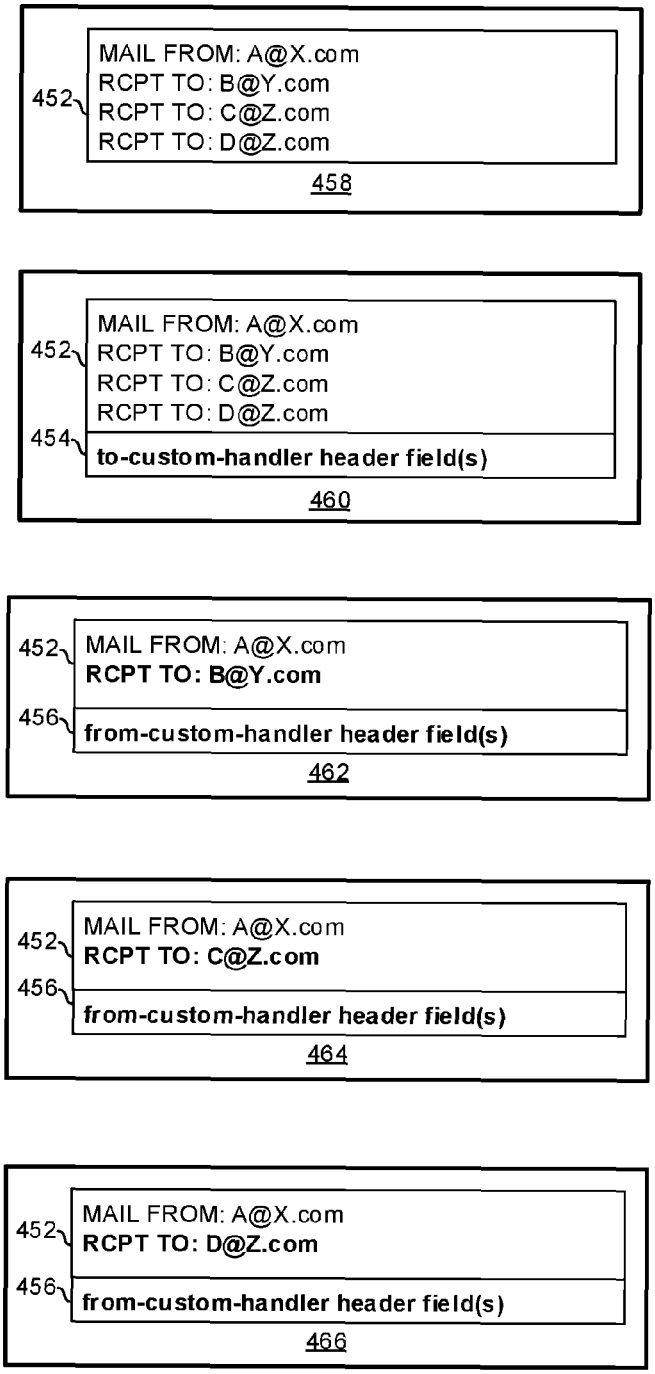
452
MAIL FROM: A@X.com
RCPT TO: B@Y.com
RCPT TO: C@Z.com
RCPT TO: D@Z.com
458
452
MAIL FROM: A@X.com
RCPT TO: B@Y.com
RCPT TO: C@Z.com
RCPT TO: D@Z.com
454
to-custom-handler header field(s)
460
452
MAIL FROM: A@X.com
RCPT TO: B@Y.com
456
from-custom-handler header field(s)
462
452
MAIL FROM: A@X.com
RCPT TO: C@Z.com
456
from-custom-handler header field(s)
464
452
MAIL FROM: A@X.com
RCPT TO: D@Z.com
456
from-custom-handler header field(s)
466

FIG. 4B

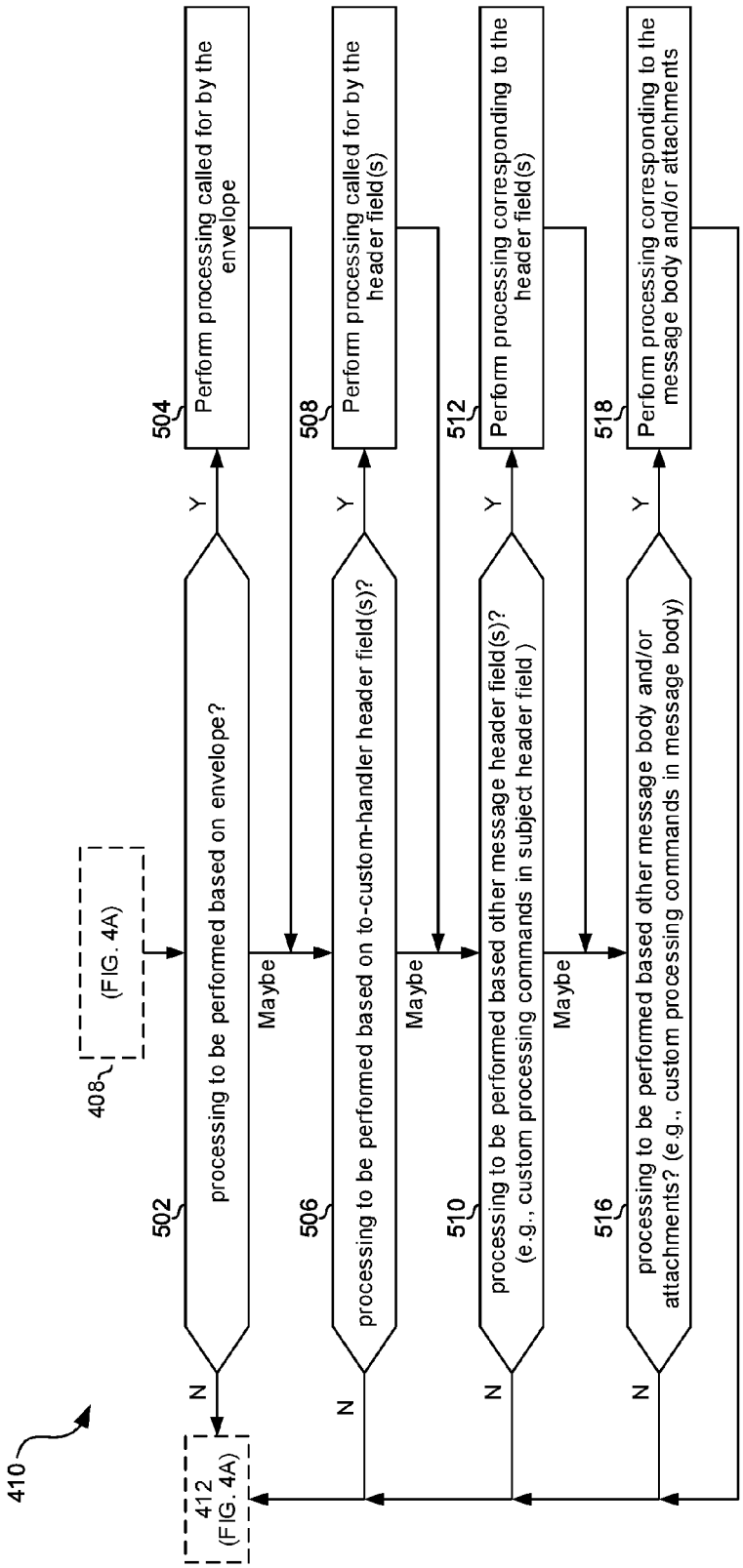
410
408
(FIG. 4A)
502
processing to be performed based on envelope?
Y
504
Perform processing called for by the envelope
Maybe
506
processing to be performed based on to-custom-handler header field(s)?
Y
508
Perform processing called for by the header field(s)
Maybe
510
processing to be performed based other message header field(s)? (e.g., custom processing commands in subject header field)
Y
512
Perform processing corresponding to the header field(s)
Maybe
516
processing to be performed based other message body and/or attachments? (e.g., custom processing commands in message body)
Y
518
Perform processing corresponding to the message body and/or attachments
N
N
N
N
412
(FIG. 4A)

FIG. 5A

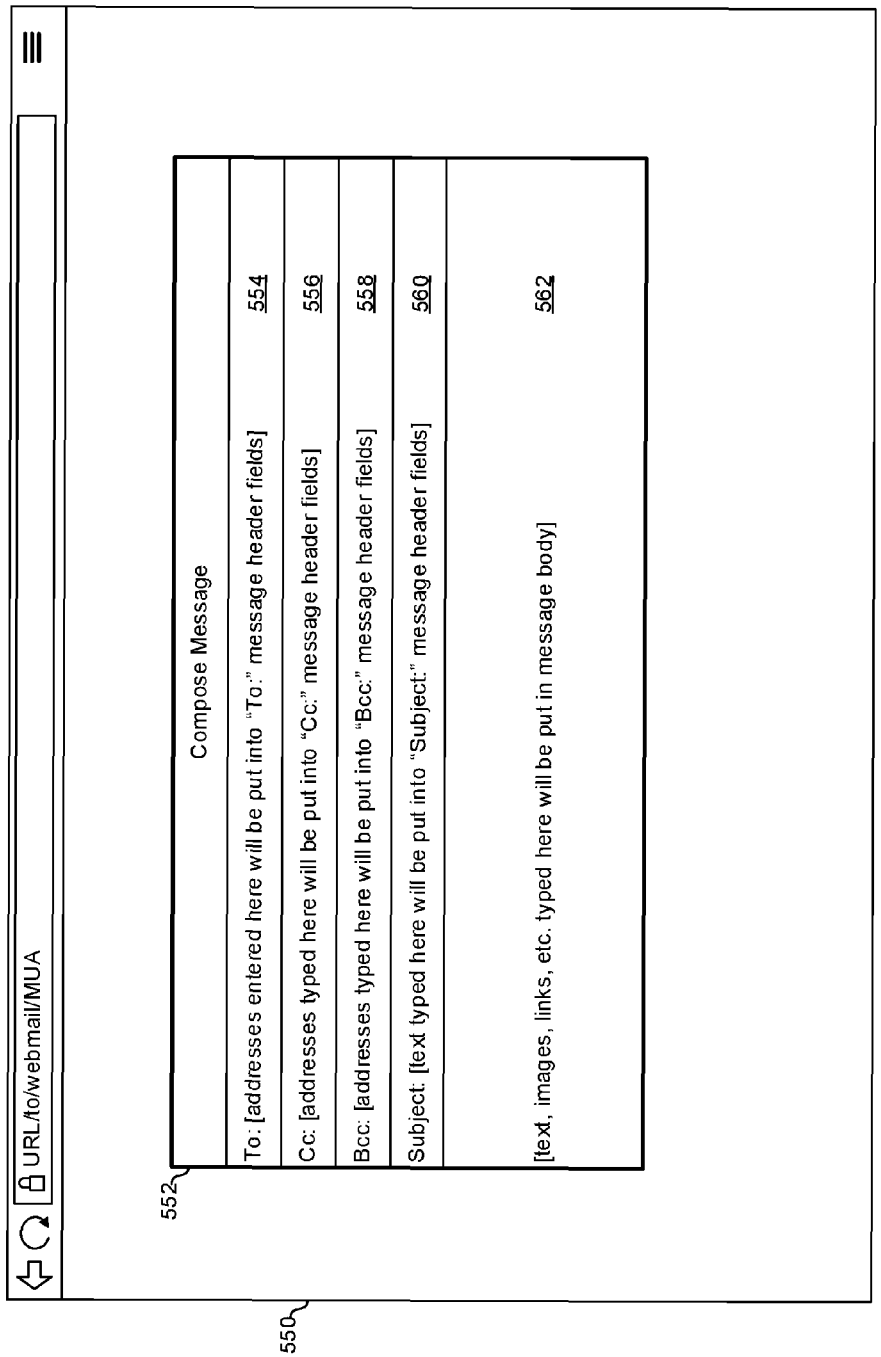
URL/to/webmail/MUA
Compose Message
To: [addresses entered here will be put into "To:" message header fields]
554
Cc: [addresses typed here will be put into "Cc:" message header fields]
556
Bcc: [addresses typed here will be put into "Bcc:" message header fields]
558
Subject: [text typed here will be put into "Subject:" message header fields]
560
[text, images, links, etc. typed here will be put in message body]
562
552
550

FIG. 5B

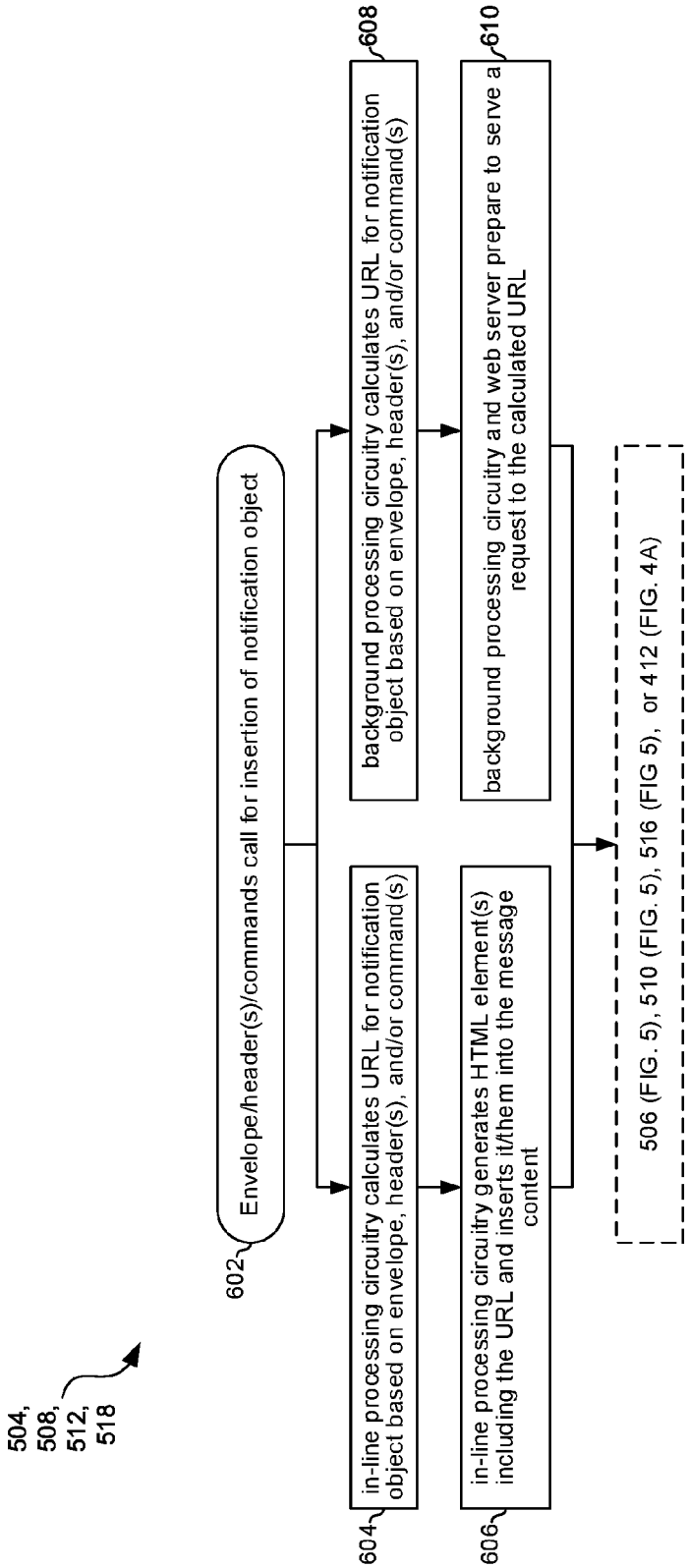
504, 508, 512, 518
602
Envelope/header(s)/commands call for insertion of notification object
604
in-line processing circuitry calculates URL for notification object based on envelope, header(s), and/or command(s)
606
in-line processing circuitry generates HTML element(s) including the URL and inserts it/them into the message content
608
background processing circuitry calculates URL for notification object based on envelope, header(s), and/or command(s)
610
background processing circuitry and web server prepare to serve a request to the calculated URL
506 (FIG. 5), 510 (FIG. 5), 516 (FIG 5), or 412 (FIG. 4A)

FIG. 6A

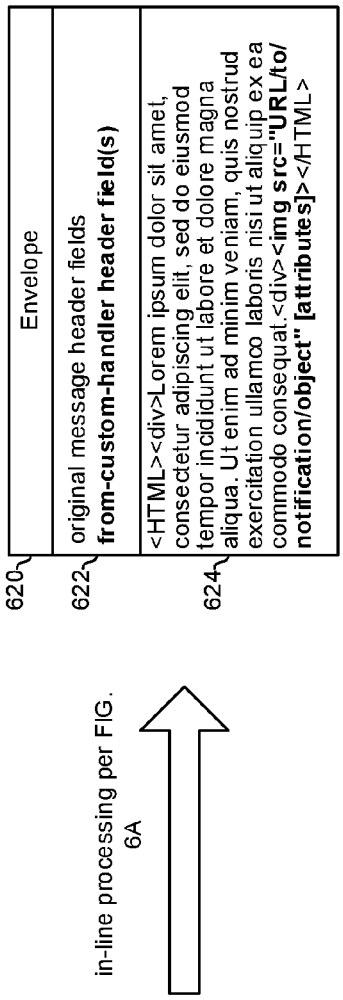
620
Envelope
622
subject: #addobject
Other original message header fields
624
<HTML> Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. </HTML>
in-line processing per FIG. 6A
620
Envelope
622
original message header fields
from-custom-handler header field(s)
624
<HTML> Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. <img src="URL/to/notification/object" [attributes]> </HTML>

FIG. 6B

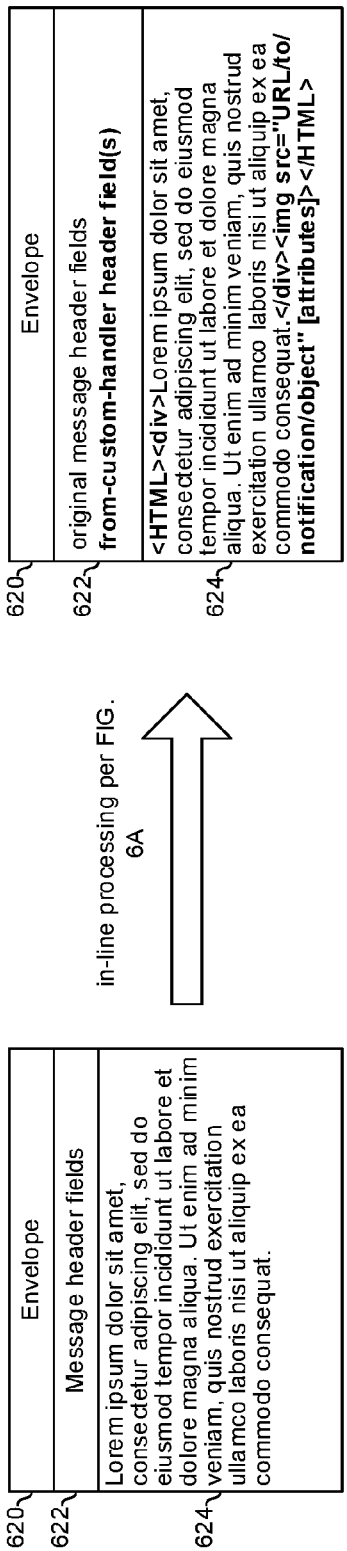
620
Envelope
622
Message header fields
624
Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat.
in-line processing per FIG. 6A
620
Envelope
622
original message header fields
from-custom-handler header field(s)
624
<HTML> Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. <img src="URL/to/notification/object" [attributes]></HTML>

FIG. 6C

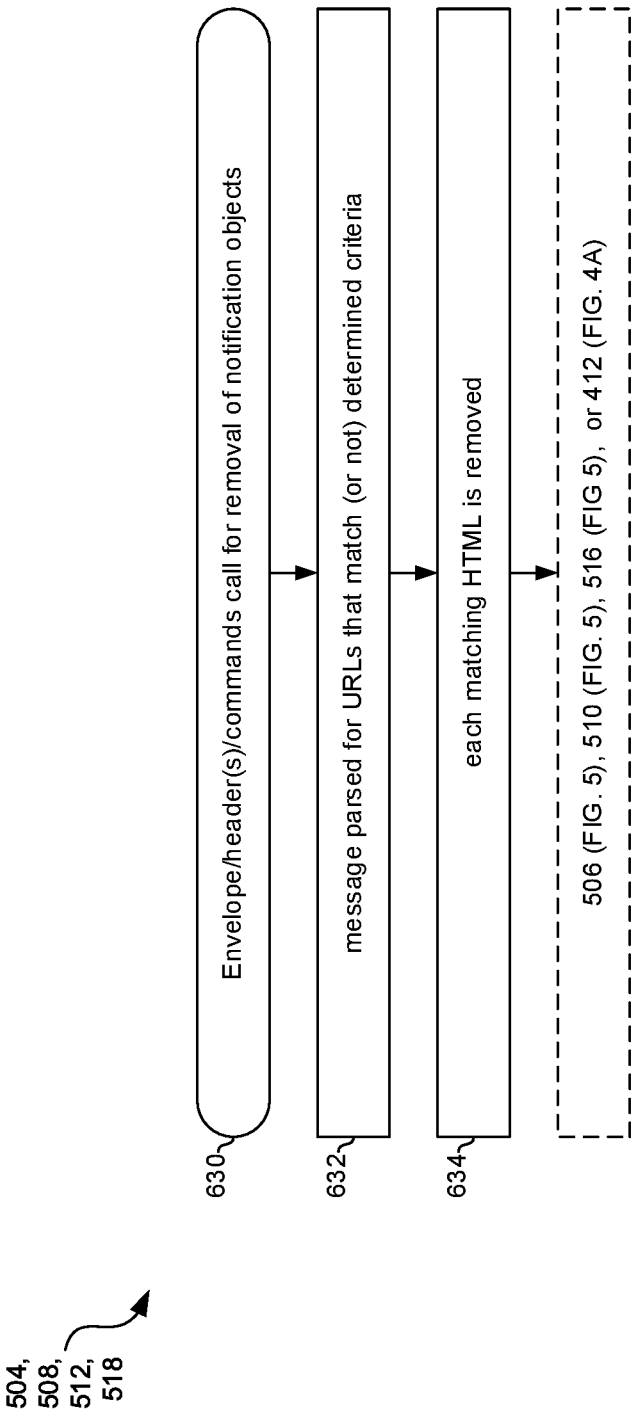
504, 508, 512, 518
630
Envelope/header(s)/commands call for removal of notification objects
632
message parsed for URLs that match (or not) determined criteria
634
each matching HTML is removed
506 (FIG. 5), 510 (FIG. 5), 516 (FIG 5), or 412 (FIG. 4A)

FIG. 6D

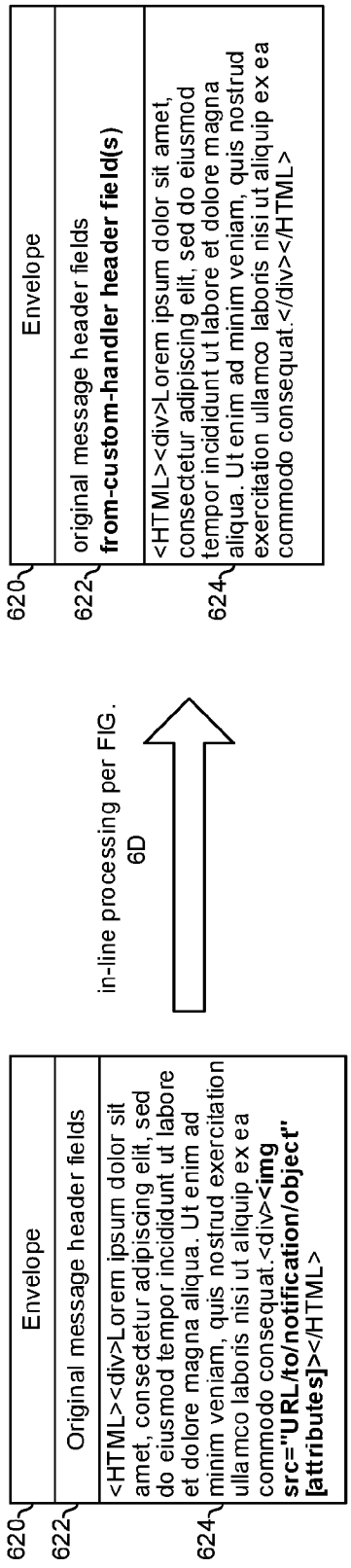
620
Envelope
622
original message header fields
from-custom-handler header field(s)
624
<HTML> Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. </HTML>
in-line processing per FIG. 6D
620
Envelope
622
Original message header fields
624
<HTML> Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. <img src="URL/to/notification/object" [attributes]></HTML>

FIG. 6E

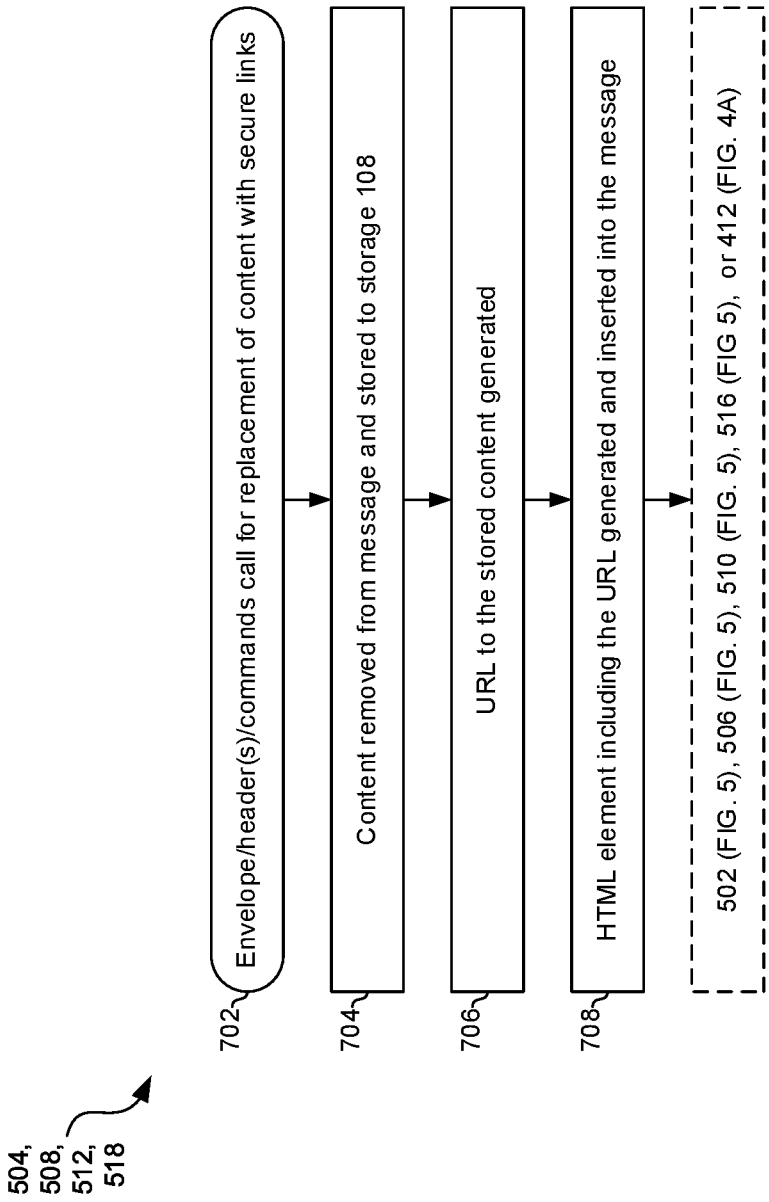
504, 508, 512, 518
702
Envelope/header(s)/commands call for replacement of content with secure links
704
Content removed from message and stored to storage 108
706
URL to the stored content generated
708
HTML element including the URL generated and inserted into the message
502 (FIG. 5), 506 (FIG. 5), 510 (FIG. 5), 516 (FIG 5), or 412 (FIG. 4A)

FIG. 7A

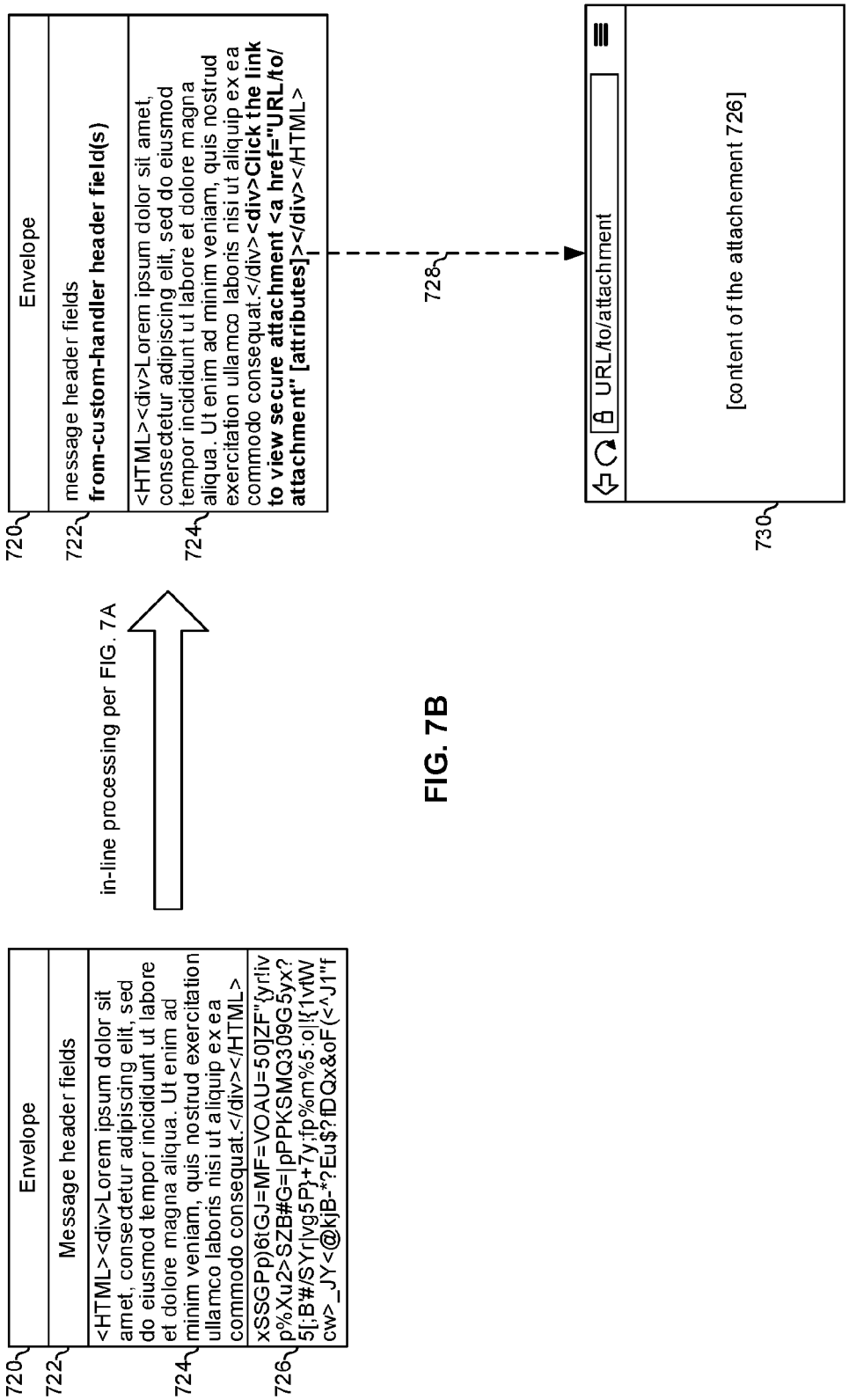
720
Envelope
722
Message header fields
724
<HTML> Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. </HTML>
726
xSSGPp)6tGJ=MF=VOAU=50]ZF"{yr!iv p%Xu2>SZB#G=|pPPKSMQ309G5yx? 5[;B#/SYr|vg5P}+7y;fp%m%5:o|!{1vW cw>_JY<@kjB-*?Eu$?fDQx&oF(<^J1"f
in-line processing per FIG. 7A
720
Envelope
722
message header fields
from-custom-handler header field(s)
724
<HTML> Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Click the link to view secure attachment <a href="URL/to/attachment" [attributes]> </HTML>
728
URL/to/attachment
[content of the attachement 726]
730

FIG. 7B

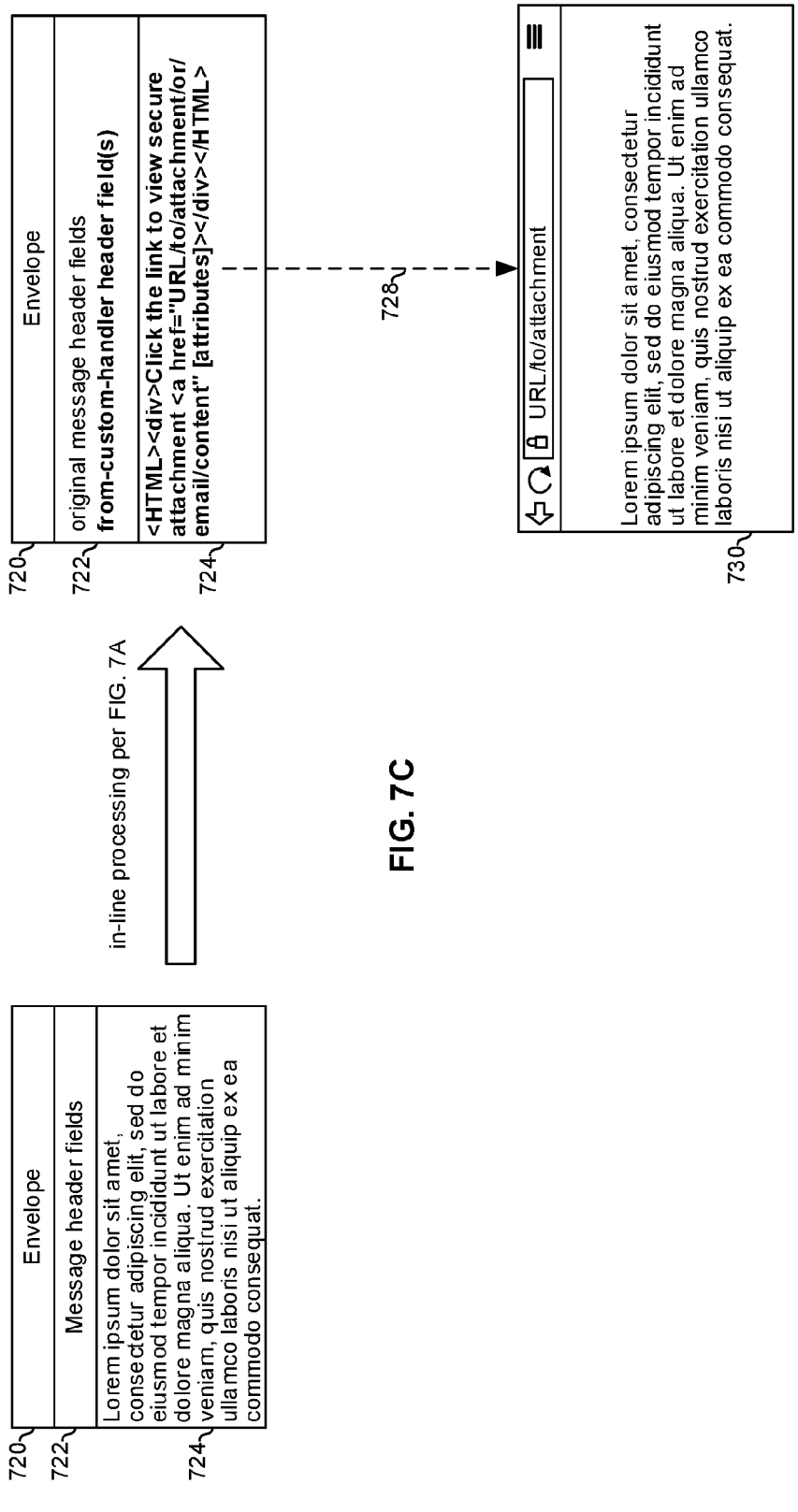
Envelope
Message header fields
Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat.
720
722
724
in-line processing per FIG. 7A
Envelope
original message header fields
from-custom-handler header field(s)
<HTML> Click the link to view secure attachment <a href="URL/to/attachment/or/email/content" [attributes]> </HTML>
720
722
724
728
URL/to/attachment
Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat.
730

FIG. 7C

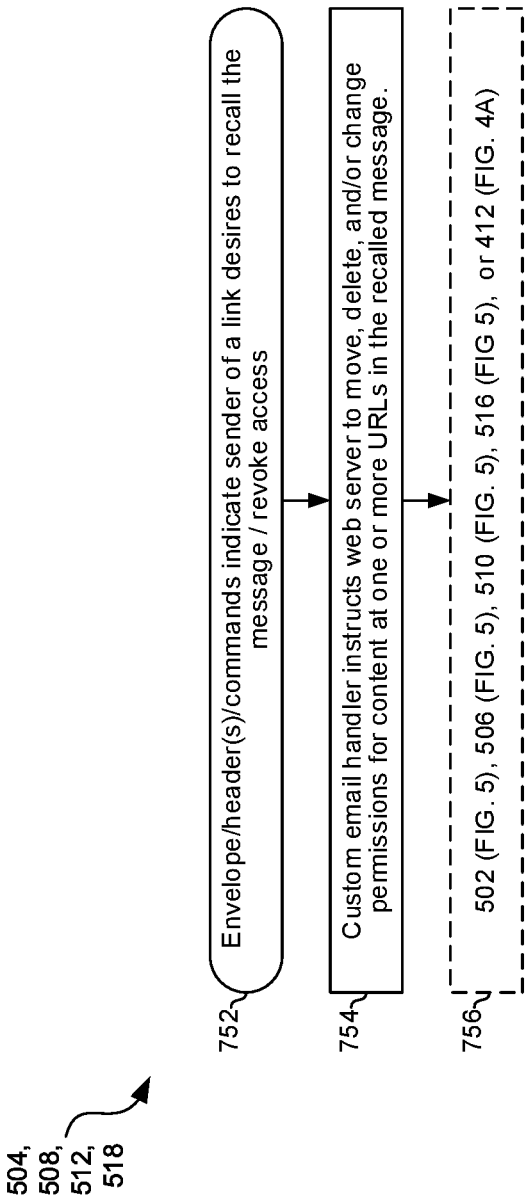
504, 508, 512, 518
752
Envelope/header(s)/commands indicate sender of a link desires to recall the message / revoke access
754
Custom email handler instructs web server to move, delete, and/or change permissions for content at one or more URLs in the recalled message.
756
502 (FIG. 5), 506 (FIG. 5), 510 (FIG. 5), 516 (FIG 5), or 412 (FIG. 4A)

FIG. 7D

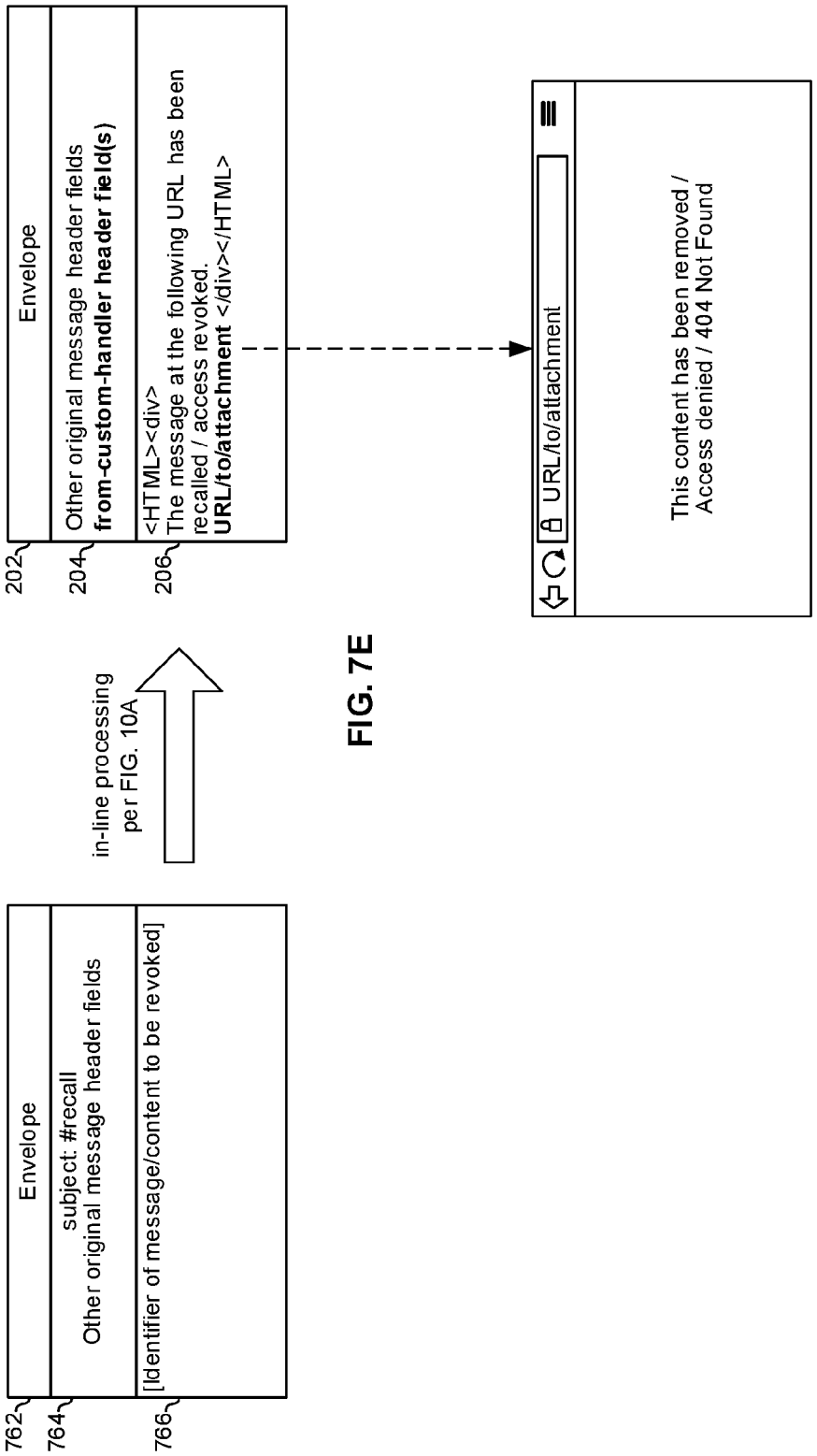
762
Envelope
764
subject: #recall
Other original message header fields
766
[identifier of message/content to be revoked]
in-line processing per FIG. 10A
202
Envelope
204
Other original message header fields
from-custom-handler header field(s)
206
<HTML>
The message at the following URL has been recalled / access revoked.
URL/to/attachment </HTML>
URL/to/attachment
This content has been removed / Access denied / 404 Not Found

FIG. 7E

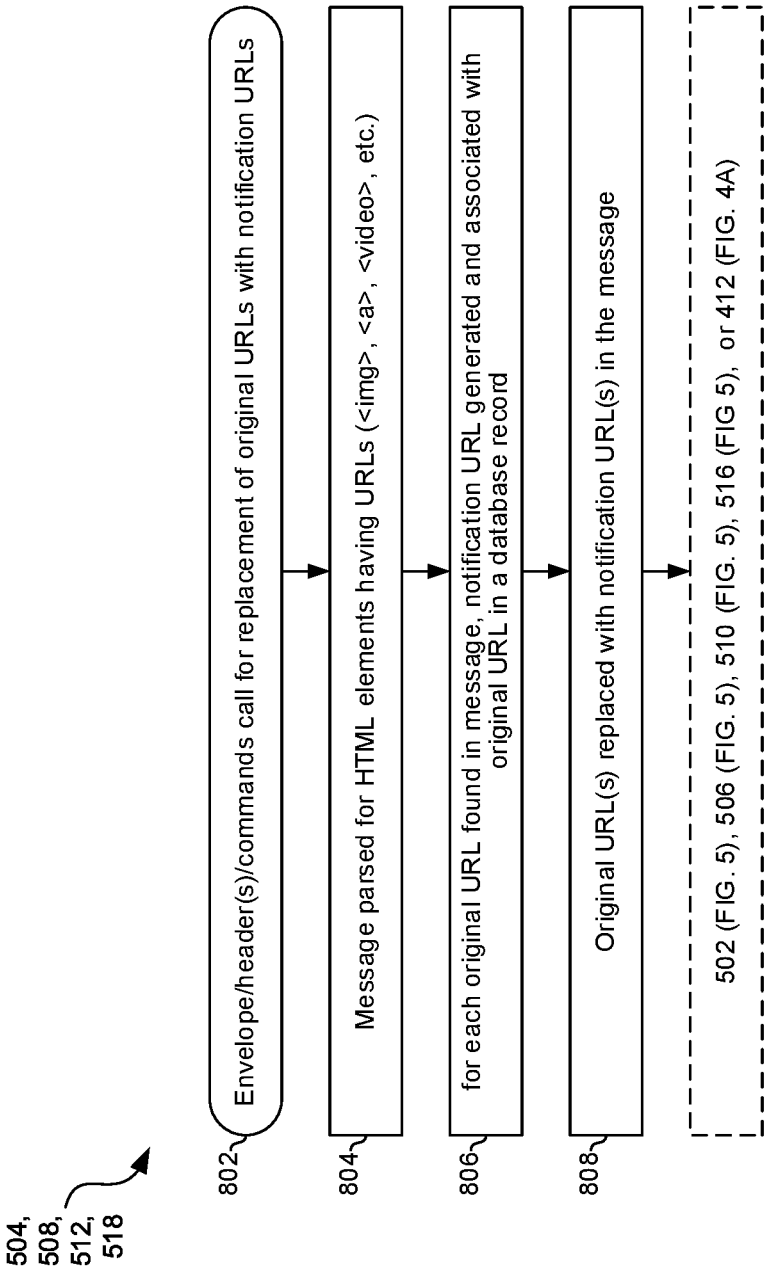
504, 508, 512, 518
802
Envelope/header(s)/commands call for replacement of original URLs with notification URLs
804
Message parsed for HTML elements having URLs (<img>, <a>, <video>, etc.)
806
for each original URL found in message, notification URL generated and associated with original URL in a database record
808
Original URL(s) replaced with notification URL(s) in the message
502 (FIG. 5), 506 (FIG. 5), 510 (FIG. 5), 516 (FIG 5), or 412 (FIG. 4A)

FIG. 8A

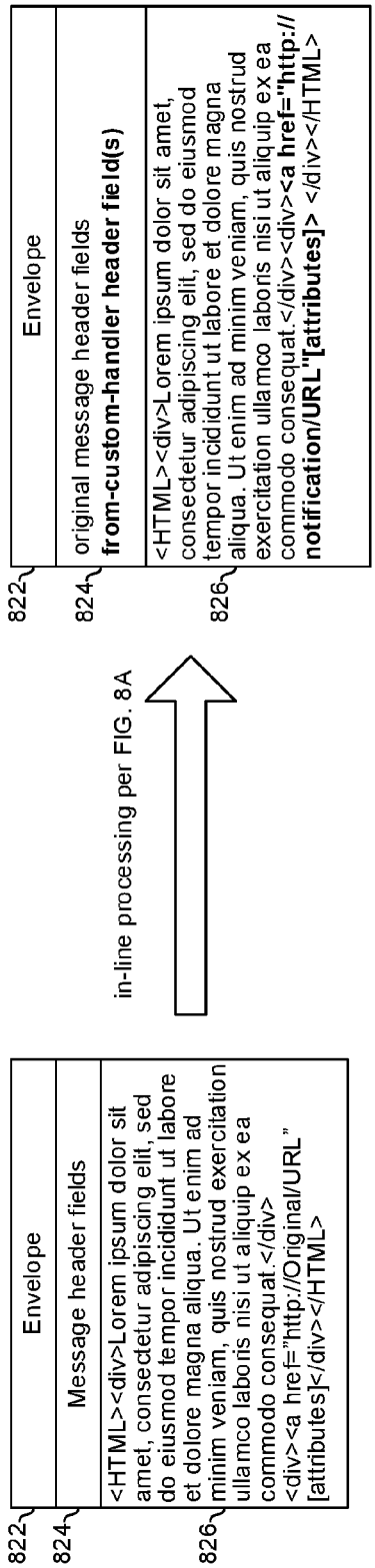
822
Envelope
824
Message header fields
826
<HTML> Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. <a href="http://Original/URL" [attributes]> </HTML>
in-line processing per FIG. 8A
822
Envelope
824
original message header fields
from-custom-handler header field(s)
826
<HTML> Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. <a href="http://notification/URL"[attributes]> </HTML>

FIG. 8B

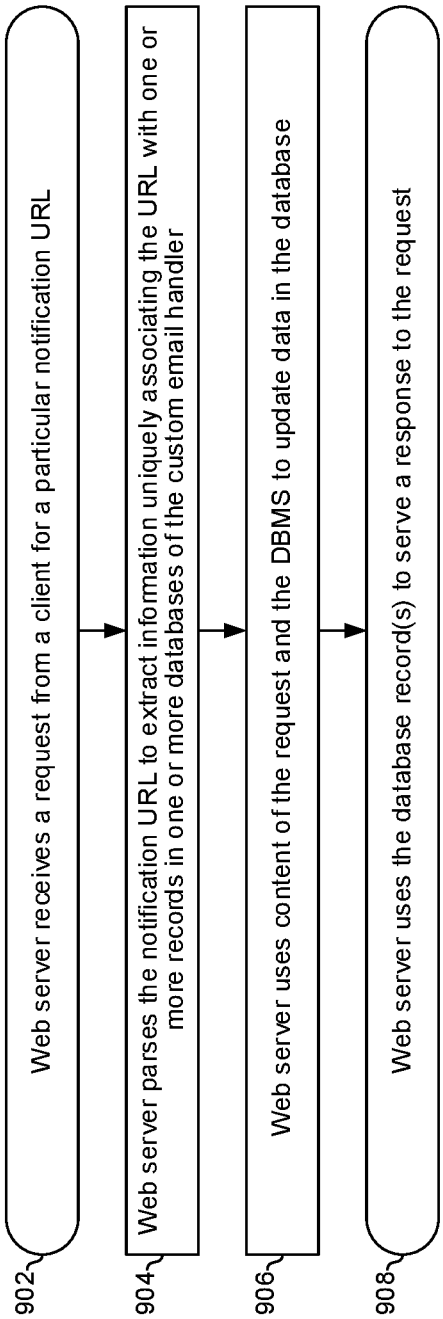
Web server receives a request from a client for a particular notification URL
902
Web server parses the notification URL to extract information uniquely associating the URL with one or more records in one or more databases of the custom email handler
904
Web server uses content of the request and the DBMS to update data in the database
906
Web server uses the database record(s) to serve a response to the request
908

FIG. 9

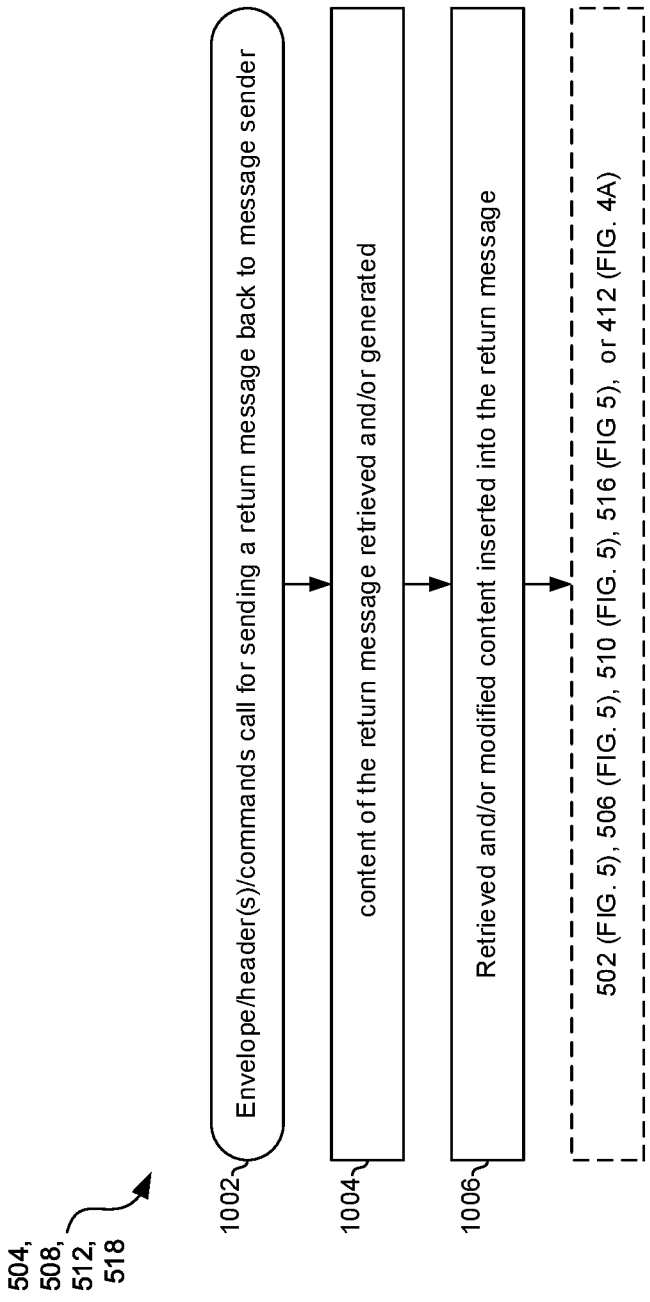
504, 508, 512, 518
1002
Envelope/header(s)/commands call for sending a return message back to message sender
1004
content of the return message retrieved and/or generated
1006
Retrieved and/or modified content inserted into the return message
502 (FIG. 5), 506 (FIG. 5), 510 (FIG. 5), 516 (FIG 5), or 412 (FIG. 4A)

FIG. 10A

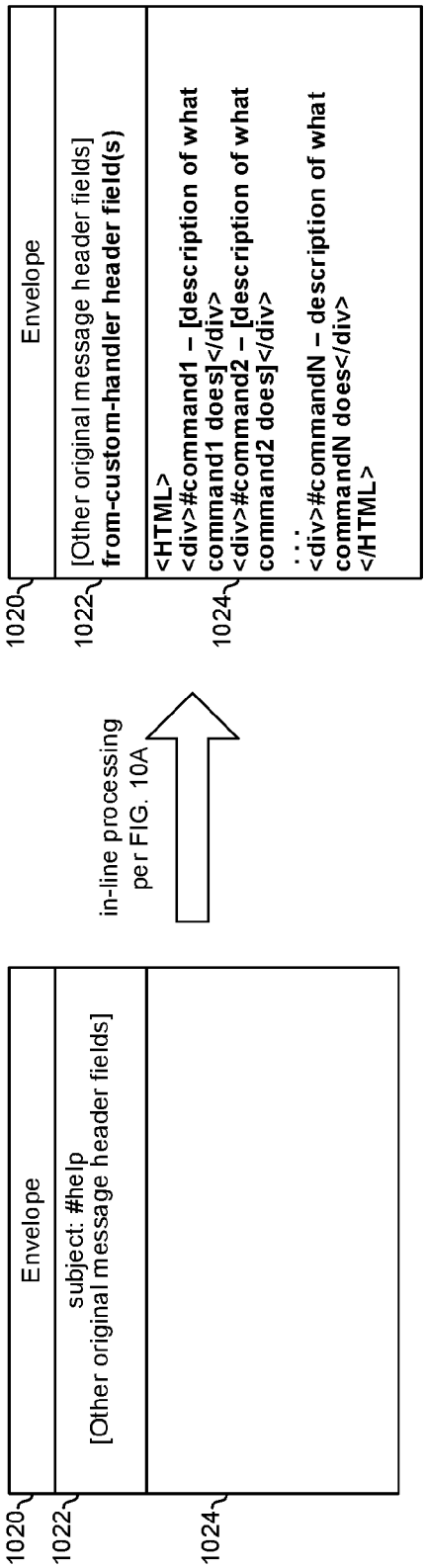
Envelope
subject: #help
[Other original message header fields]
1020
1022
1024
in-line processing
per FIG. 10A
Envelope
[Other original message header fields]
from-custom-handler header field(s)
<HTML>
#command1 – [description of what
command1 does]
#command2 – [description of what
command2 does]
. . .
#commandN – description of what
commandN does
</HTML>
1020
1022
1024

FIG. 10B

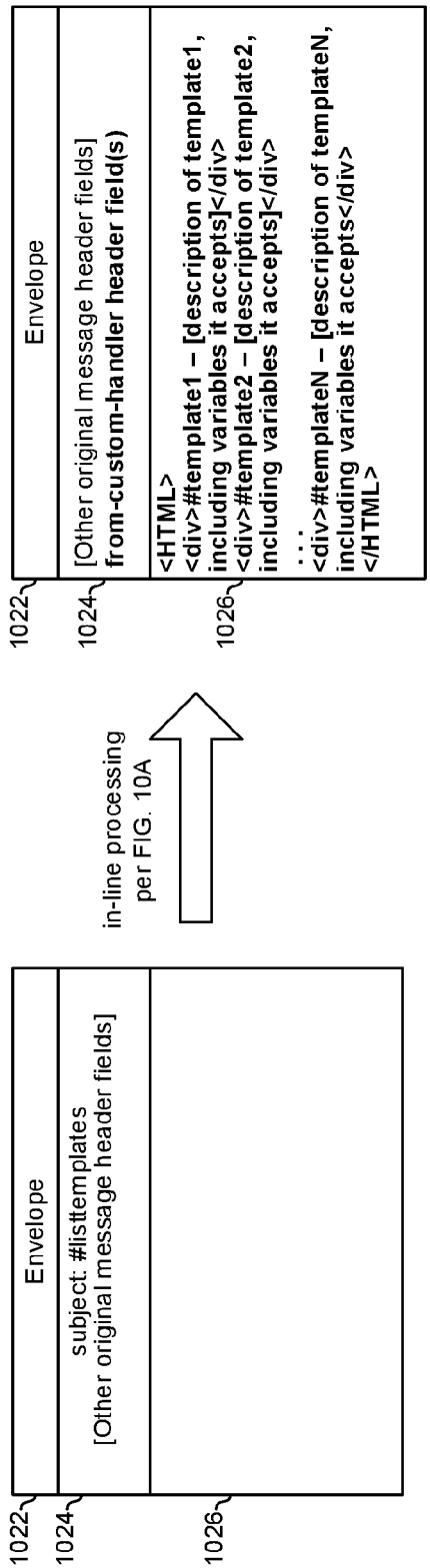
Envelope
subject: #listtemplates
[Other original message header fields]
1022
1024
1026
in-line processing
per FIG. 10A
Envelope
[Other original message header fields]
from-custom-handler header field(s)
<HTML>
#template1 – [description of template1,
including variables it accepts]
#template2 – [description of template2,
including variables it accepts]
. . .
#templateN – [description of templateN,
including variables it accepts
</HTML>
1022
1024
1026

FIG. 10C

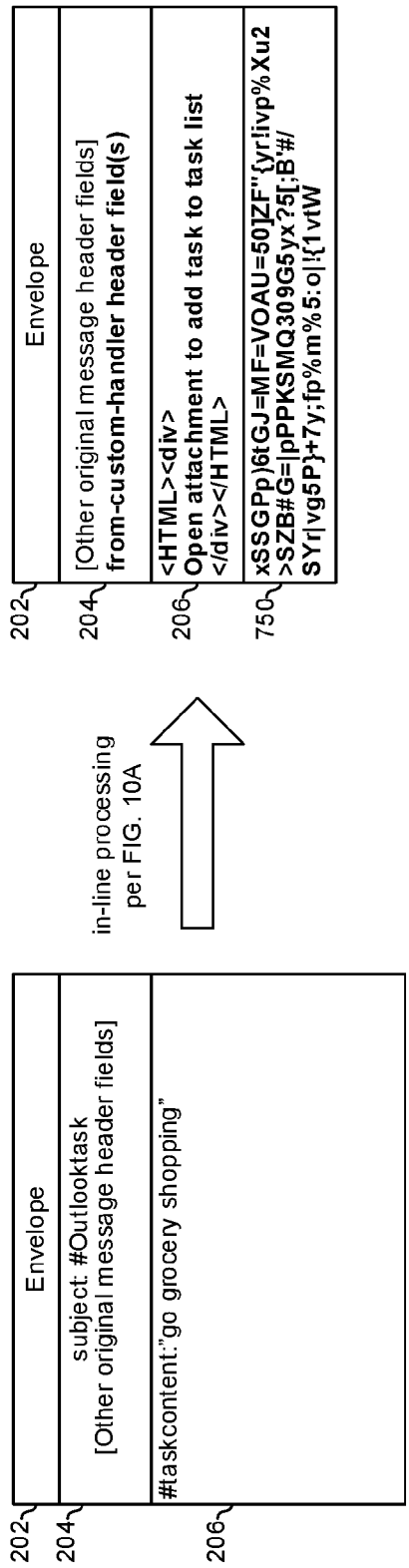
202
Envelope
204
subject: #Outlooktask
[Other original message header fields]
206
#taskcontent:"go grocery shopping"
in-line processing
per FIG. 10A
202
Envelope
204
[Other original message header fields]
from-custom-handler header field(s)
206
<HTML>
Open attachment to add task to task list
</HTML>
750
xSSGPp)6tGJ=MF=VOAU=50]ZF"{yr!ivp%Xu2
>SZB#G=|pPPKSMQ309G5yx?5[;B'#/
SYr|vg5P}+7y;fp%m%5:o|!{1vtW

FIG. 10D

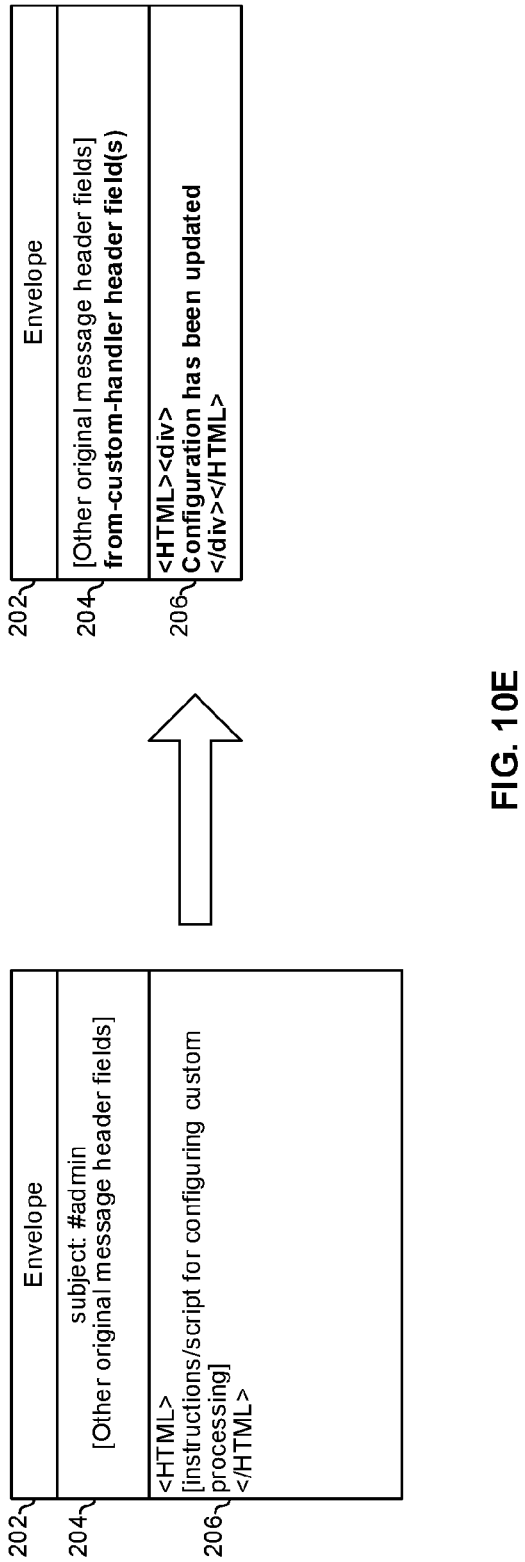
Envelope
[Other original message header fields]
from-custom-handler header field(s)
<HTML>
Configuration has been updated
</HTML>
202
204
206
Envelope
subject: #admin
[Other original message header fields]
<HTML>
[instructions/script for configuring custom processing]
</HTML>
202
204
206

FIG. 10E

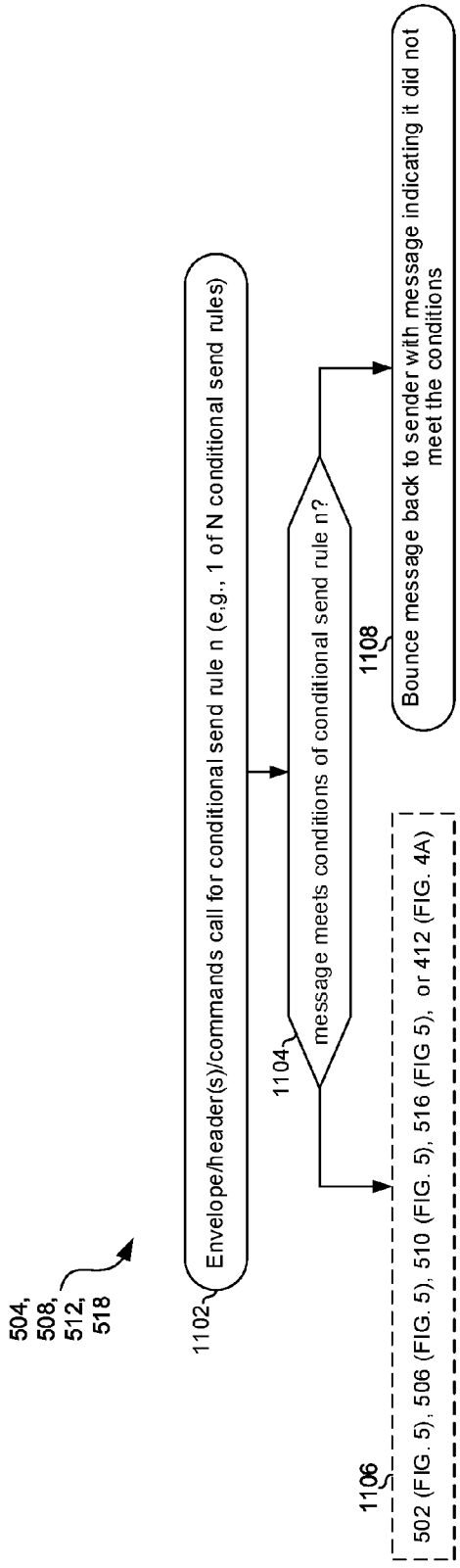
504, 508, 512, 518
1102
Envelope/header(s)/commands call for conditional send rule n (e.g., 1 of N conditional send rules)
1104
message meets conditions of conditional send rule n?
1108
Bounce message back to sender with message indicating it did not meet the conditions
1106
502 (FIG. 5), 506 (FIG. 5), 510 (FIG. 5), 516 (FIG 5), or 412 (FIG. 4A)

FIG. 11

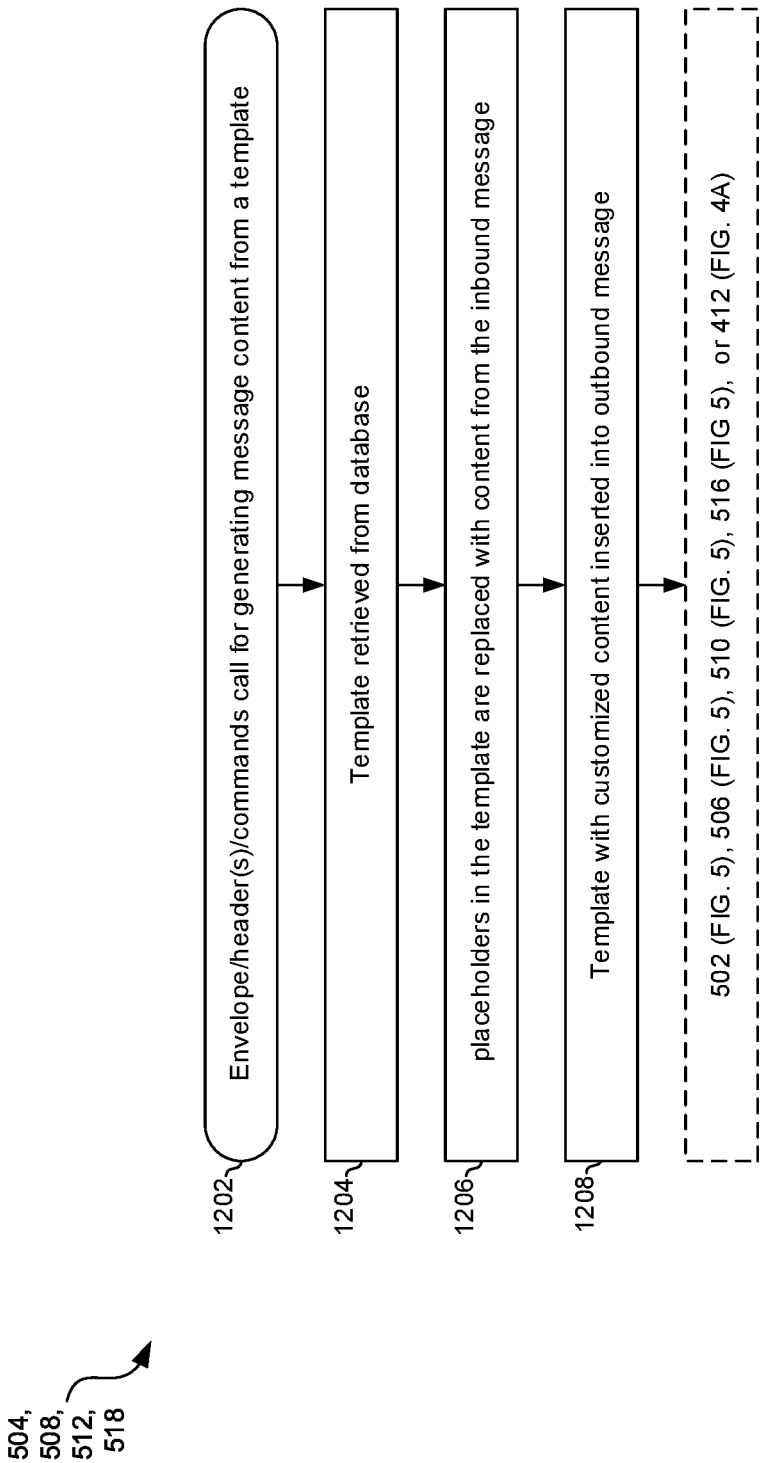
Envelope/header(s)/commands call for generating message content from a template
Template retrieved from database
placeholders in the template are replaced with content from the inbound message
Template with customized content inserted into outbound message
502 (FIG. 5), 506 (FIG. 5), 510 (FIG. 5), 516 (FIG 5), or 412 (FIG. 4A)
1202
1204
1206
1208
504, 508, 512, 518

FIG. 12A

FIG. 12B

FIG. 12C

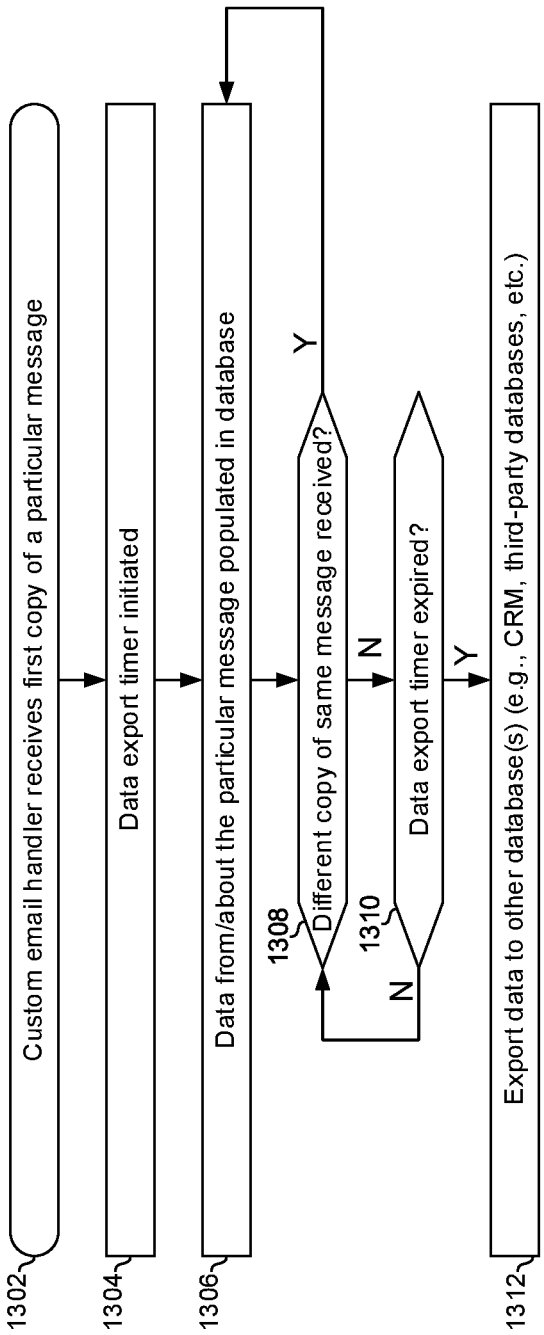
Custom email handler receives first copy of a particular message
Data export timer initiated
Data from/about the particular message populated in database
Different copy of same message received?
Y
N
Data export timer expired?
N
Y
Export data to other database(s) (e.g., CRM, third-party databases, etc.)
1302
1304
1306
1308
1310
1312

FIG. 13A

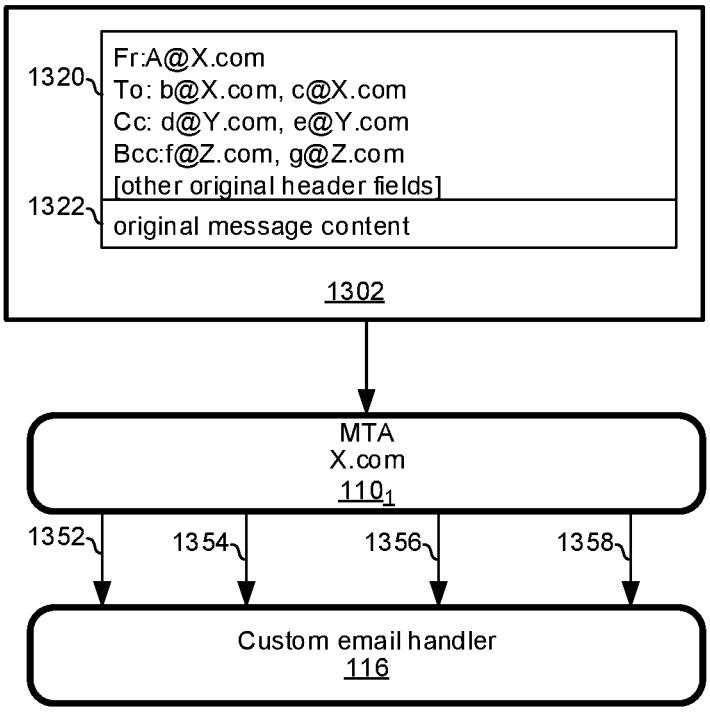
1320
Fr:A@X.com
To: b@X.com, c@X.com
Cc: d@Y.com, e@Y.com
Bcc:f@Z.com, g@Z.com
[other original header fields]
1322
original message content
1302
MTA
X.com
110 1
1352
1354
1356
1358
Custom email handler
116

FIG. 13B

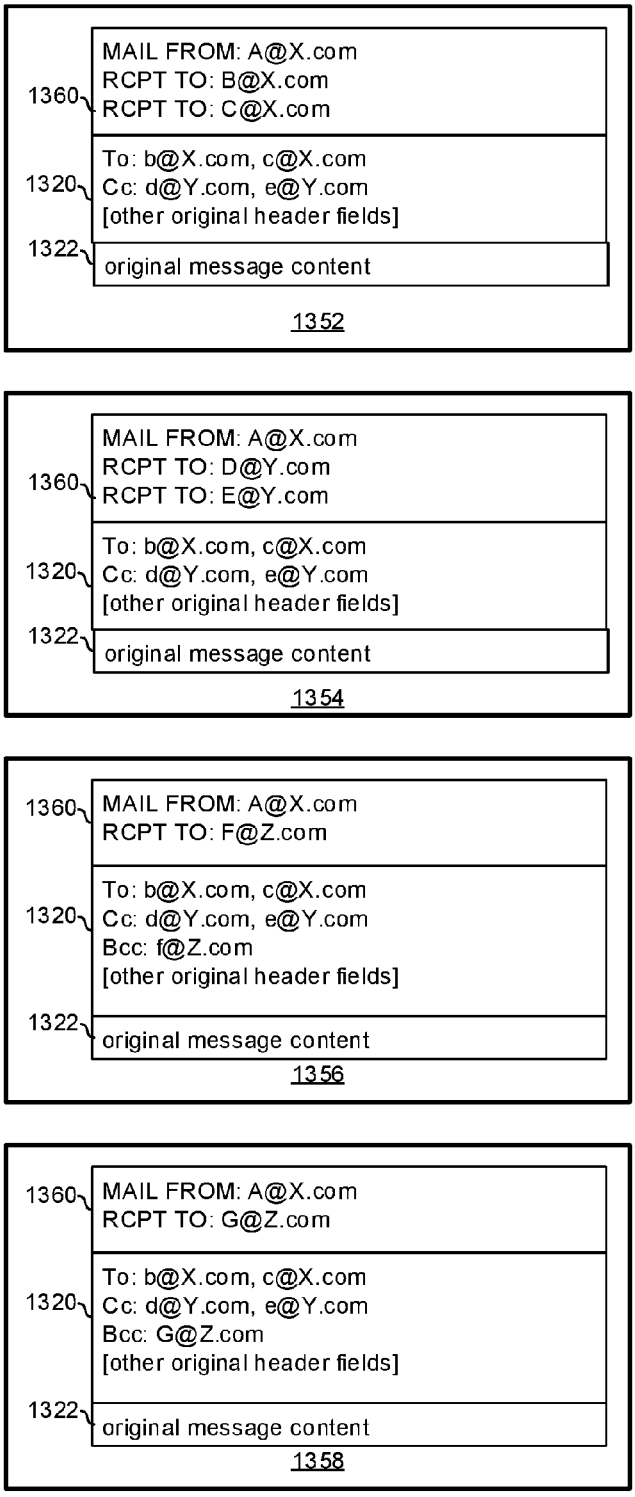
1360
MAIL FROM: A@X.com
RCPT TO: B@X.com
RCPT TO: C@X.com
1320
To: b@X.com, c@X.com
Cc: d@Y.com, e@Y.com
[other original header fields]
1322
original message content
1352
1360
MAIL FROM: A@X.com
RCPT TO: D@Y.com
RCPT TO: E@Y.com
1320
To: b@X.com, c@X.com
Cc: d@Y.com, e@Y.com
[other original header fields]
1322
original message content
1354
1360
MAIL FROM: A@X.com
RCPT TO: F@Z.com
1320
To: b@X.com, c@X.com
Cc: d@Y.com, e@Y.com
Bcc: f@Z.com
[other original header fields]
1322
original message content
1356
1360
MAIL FROM: A@X.com
RCPT TO: G@Z.com
1320
To: b@X.com, c@X.com
Cc: d@Y.com, e@Y.com
Bcc: G@Z.com
[other original header fields]
1322
original message content
1358

FIG. 13C

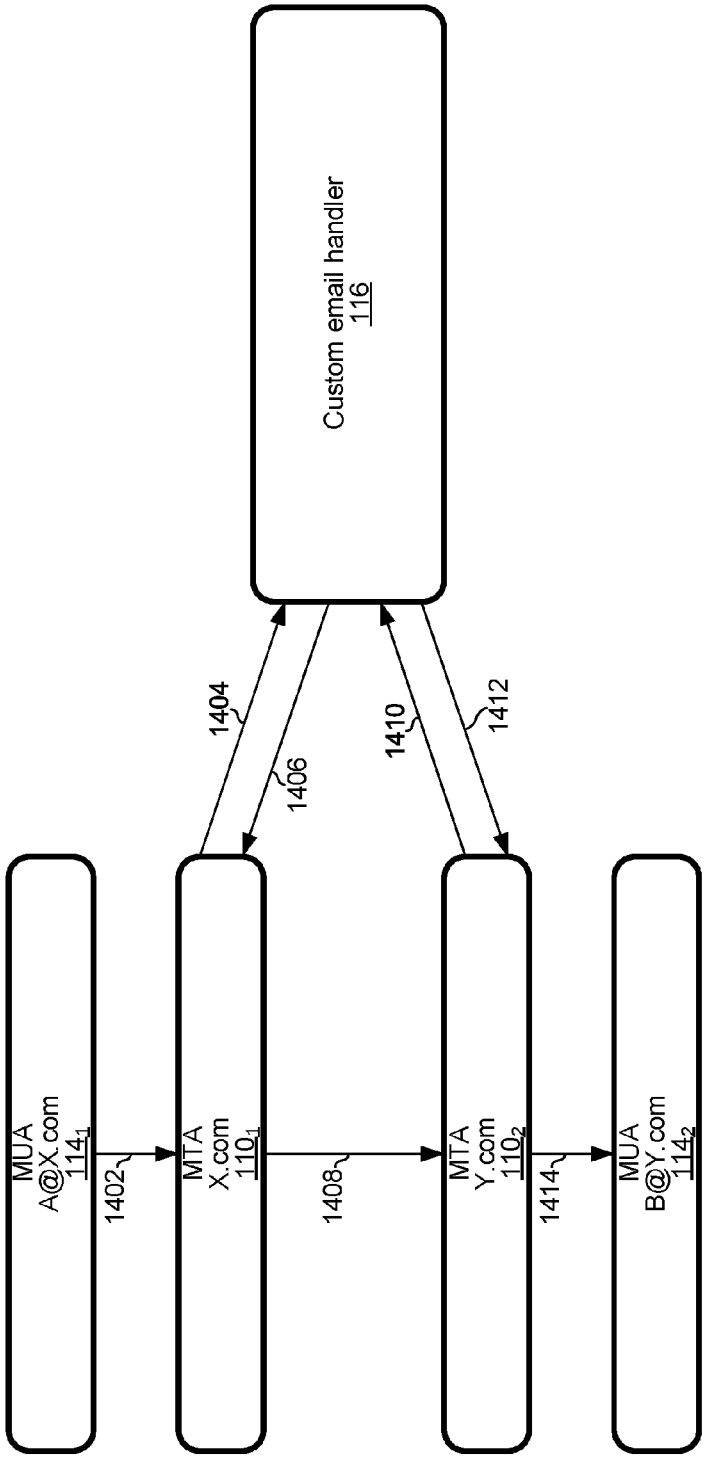
Custom email handler
116
1404
1406
1410
1412
MUA
A@X.com
114₁
MTA
X.com
110₁
MTA
Y.com
110₂
MUA
B@Y.com
114₂
1402
1408
1414

FIG. 14A

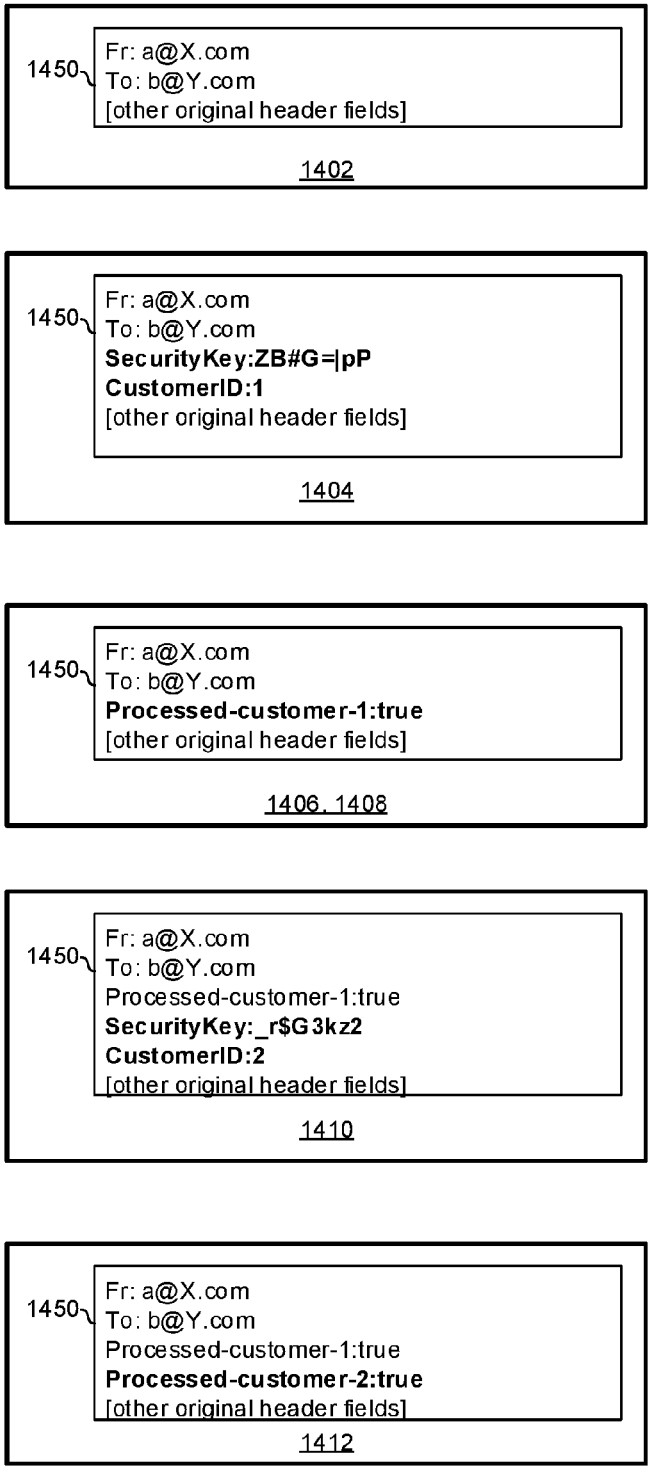
1450
Fr: a@X.com
To: b@Y.com
[other original header fields]
1402
1450
Fr: a@X.com
To: b@Y.com
SecurityKey:ZB#G=|pP
CustomerID:1
[other original header fields]
1404
1450
Fr: a@X.com
To: b@Y.com
Processed-customer-1:true
[other original header fields]
1406, 1408
1450
Fr: a@X.com
To: b@Y.com
Processed-customer-1:true
SecurityKey:_r$G3kz2
CustomerID:2
[other original header fields]
1410
1450
Fr: a@X.com
To: b@Y.com
Processed-customer-1:true
Processed-customer-2:true
[other original header fields]
1412

FIG. 14B

METHOD AND SYSTEM FOR EMAIL DISAMBIGUATION

PRIORITY CLAIM

This application is a continuation of U.S. patent application Ser. No. 14/992,194 filed on Jan. 11, 2016, which is hereby incorporated herein by reference.

BACKGROUND

Limitations and disadvantages of conventional approaches to email will become apparent to one of skill in the art, through comparison of such approaches with some aspects of the present method and system set forth in the remainder of this disclosure with reference to the drawings.

BRIEF SUMMARY

Methods and systems are provided for a client agnostic email processing system, substantially as illustrated by and/or described in connection with at least one of the figures, as set forth more completely in the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** illustrates an example system configured to provide client agnostic email processing.

FIG. **2**A illustrates a first example flow of an email message through the system of FIG. **1**.

FIG. **2**B illustrates a second example flow of an email message through the system of FIG. **1**.

FIG. **2**C illustrates a third example flow of an email message through the system of FIG. **1**.

FIG. **3** is a flowchart illustrating an example process performed by a mail transfer agent (MTA) of FIG. **1**.

FIG. **4**A is a flowchart illustrating example in-line processing performed by the customized email handler of FIG. **1**.

FIG. **4**B illustrates example details of repackaging an email message into multiple envelopes.

FIG. **5**A is a flowchart illustrating an example implementation of the customized email processing block of FIG. **4**A.

FIG. **5**B illustrates an example email message composing interface of a MUA.

FIG. **6**A is a flowchart illustrating an example implementation in which one of the blocks of FIG. **5**A calls for the custom email handler to add of a notification object into an email message during in-line processing of the email message.

FIG. **6**B illustrates an example implementations of the process of FIG. **6**A in which a notification object is inserted into HTML-formatted email message body during in-line processing.

FIG. **6**C illustrates an example implementations of the process of FIG. **6**A in which plain text formatted email message content is converted to HTML-formatted email message content with a notification object.

FIG. **6**D is a flowchart illustrating an example implementation in which one of the blocks of FIG. **5**A calls for the custom email handler to remove a notification object from an email message during in-line processing of the email message.

FIG. **6**E illustrates an example implementations of the process of FIG. **6**D in which a notification object is removed from email message during in-line processing of the email message.

FIG. **7**A is a flowchart illustrating an example implementation in which one of the blocks of FIG. **5**A calls for the custom email handler to replace email message content with a hyperlink to securely hosted content.

FIG. **7**B illustrates an example implementation of the process of FIG. **7**A in which an attachment to an email message is removed and a hyperlink to a securely hosted copy of the attachment is inserted into the body of the email message.

FIG. **7**C illustrates an example implementation of the process of FIG. **7**A in which plain text formatted content of an email message is removed and a hyperlink to a securely hosted copy of the plain text content is inserted into the content of the email message.

FIG. **7**D is a flowchart illustrating an example implementation in which one of the blocks of FIG. **5**A calls for the custom email handler to revoke access to the content stored at a the target of a hyperlink sent in a previous email message.

FIG. **7**E illustrates an example implementations of the process of FIG. **7**D.

FIG. **8**A is a flowchart illustrating an example implementation in which one of the blocks of FIG. **5**A calls for replacing original URLs in an email message with notification URLs.

FIG. **8**B illustrates an example implementation of the process of FIG. **5**A.

FIG. **9** is a flowchart illustrating an example process performed by a web server of the system of FIG. **1**.

FIG. **10**A is a flowchart illustrating an example implementation in which one of the blocks of FIG. **5**A calls for sending an email message back to the sender of the email message received at the start of FIG. **4**.

FIG. **10**B illustrates an example implementation of the process of FIG. **10**A in which content of the email message sent back to the sender provides information about custom processing commands available to the sender.

FIG. **10**C illustrates an example implementation of the process of FIG. **10**A in which content of the email message sent back to the sender provides a list of email message templates available to the sender.

FIG. **10**D illustrates an example implementation of the process of FIG. **10**A in which content of the email message sent back to the sender is an attachment that triggers the addition of a task to a task list.

FIG. **10**E illustrates an example implementation of the process of FIG. **10**A in which a user can perform configuration/administration of the custom email handler via custom processing commands in an email message.

FIG. **11** is a flowchart illustrating an example implementation in which one of the blocks of FIG. **5**A calls for the custom email handler to send (or bounce) a message only if one or more conditions associated with the email message are true (or not).

FIG. **12**A is a flowchart illustrating an example implementation in which one of the blocks of FIG. **5**A calls for generating content of an email message based on a template.

FIGS. **12**B and **12**C illustrate an example implementation of the process of FIG. **12**A.

FIGS. **13**A-**13**C illustrate handling of email messages with blind carbon copy recipients, in accordance with an example implementation of this disclosure.

FIG. **14**A illustrates a third example flow of an email message through the network of FIG. **1**.

FIG. **14**B illustrates example details of the email message of FIG. **14**A.

DETAILED DESCRIPTION

FIG. **1** illustrates an example system configured to provide client agnostic email processing. The system comprises a plurality of devices **102** (e.g., servers), a plurality of devices **112** (e.g., desktop computers, laptop computers, tablet computers, and/or smartphones), and a custom email handler **116** (e.g., one or more servers).

Each of the devices $\mathbf{102}_x$ (x between 1 and 3 in the example shown, where **3** was chosen arbitrarily for illustration) (e.g., servers residing in a data center) comprises processing circuitry **104** (e.g., a chipset or system on chip comprising a CPU, memory, graphics processor, I/O controller, etc.), network interface circuitry **106** (e.g., Ethernet, Wi-Fi, and/or the like) and storage circuitry **108** (e.g., HDD, SSD, and/or the like, and associated control/drive circuitry) configured (e.g., via an application specific circuit, firmware, and/or software) to operate as a mail transfer agent (MTA) $\mathbf{110}_X$. For purposes of illustration, three MTAs $\mathbf{110}_1$-$\mathbf{110}_3$ associated with three domains are shown, but in implementation any number of MTAs **110** associated with any number of domains may be handled by custom email handler **116**.

Each of the devices $\mathbf{112}_y$ (y between 1 and 4 in the example shown, where **4** was chosen arbitrarily for illustration) comprises processing circuitry **104** (e.g., a chipset or system on chip comprising a CPU, memory, graphics processor, I/O controller, etc.), network interface circuitry **106** (e.g., Ethernet, Wi-Fi, and/or the like) and storage circuitry **108** (e.g., HDD, SSD, and/or the like, and associated control/drive circuitry) configured (e.g., via an application specific circuit, software, and/or firmware) to operate as a mail user agent (MUA) **114** (also referred to as an "email client"). For example, MUAs $\mathbf{114}_1$ and $\mathbf{114}_2$ may each be a locally-installed MUA (e.g., Outlook, Outlook Express, or the like) and MUAs $\mathbf{114}_3$ and $\mathbf{114}_4$ may be "webmail" type MUAs running in a web browser (e.g., gmail.com®, outlook.com®, and/or the like). For clarity of description, the devices **112** will be referred to below as "MUAs **114**." For purposes of illustration, four MUAs $\mathbf{114}_1$-$\mathbf{114}_4$ associated with three domains are shown, but in implementation any number of MUAs **114** associated with any number of domains may be handled by custom email handler **116**.

The custom email handler **116** comprises processing circuitry **104** (e.g., a chipset or system on chip comprising a CPU, memory, graphics processor, I/O controller, etc.), network interface circuitry **106** (e.g., Ethernet, Wi-Fi, and/or the like) and storage circuitry **108** (e.g., HDD, SSD, and/or the like, and associated control/drive circuitry) configured (e.g., via an application specific circuit, software, and/or firmware) to operate as an in-line email processing circuitry **118**, background email processing circuitry **120**, web server circuitry **122**, and database management system (DBMS) **124** (for simplicity of description, the DBMS **124** and an underlying database in storage **108** is referred to as simply a "database"). The custom email handler **116** may be part of one or more of the domains associated (e.g., in a DNS record) with the MTAs $\mathbf{112}_1$-$\mathbf{112}_3$ and/or may be part of a separate domain. The custom email handler **116**, or components thereof, may reside on one or more of the devices $\mathbf{102}_1$-$\mathbf{102}_3$, on one or more of the devices $\mathbf{112}_1$-$\mathbf{112}_4$, and/or on devices separate from the devices $\mathbf{102}_1$-$\mathbf{102}_3$ and $\mathbf{112}_1$-$\mathbf{112}_4$.

The in-line email processing circuitry **118** is configured to receive an email message that is in route to one or more recipients (e.g., indicated by "RCPT TO:" field(s) of the email message where SMTP is used), process the email message, and then allow the email message to continue on to the intended recipients and/or return the email message to its original sender. That is, the processing by in-line email processing circuitry **118** occurs in line with the delivery of the email message, and thus aspects of this disclosure pertain to reducing duration of in-line processing so as to reduce delay in email message delivery.

The background email processing circuitry **120** is configured to process email messages (and/or data extracted from email messages and/or metadata about email messages) in parallel with the email messages being delivered to their intended recipients. That is, processing by background email processing circuitry **120** does not delay delivery of the email messages.

FIG. **2**A illustrates a first example flow of an email message through the system of FIG. **1**. In the example shown, a user A@X.com is sending an email message to three recipients: B@Y.com, C@Z.com, and D@Z.com. First, indicated by arrow **202**, the message is sent from sender A's MUA $\mathbf{114}_1$ to MTA $\mathbf{110}_1$ (e.g., an MTA, referred to here as "sender MTA", which is configured into an "outgoing mail server" or similar setting of the MUA $\mathbf{114}_1$). The MTA $\mathbf{110}_1$ performs the process of FIG. **3**, and, in the example of FIG. **2**A, determines to send the message to in-line email processing circuitry **118** of custom email handler **116**, as indicated by arrow **204**. The custom email handler **116** receives the email message, performs custom in-line processing on the email message (which may involve interacting with database **124**, queuing the message for processing by background email processing circuitry **120**, and/or other operations internal to the custom email handler **116**), and then returns the email message to MTA $\mathbf{110}_1$, as indicated by arrow **206**. MTA $\mathbf{110}_1$ then sends the email message to MTA $\mathbf{110}_2$ and the MTA $\mathbf{110}_3$ (indicated, respectively, by the DNS records for Y.com and Z.com and each of which is referred to here as a "recipient MTA"). This is shown as arrows **208** and **210**, respectively. MUAs $\mathbf{114}_4$ and $\mathbf{114}_3$ then retrieve the email message from MTA $\mathbf{110}_3$, as indicated by arrows **212** and **214**, and MUA $\mathbf{114}_2$ retrieves the message from MTA $\mathbf{110}_2$ (arrow **216**). In instances that the email message contains remotely hosted content (e.g., images, videos, etc.) and/or hyperlinks, the MUAs $\mathbf{114}_2$, $\mathbf{114}_3$, and $\mathbf{114}_4$ may interact with the web server circuitry **122** as indicated by arrows **218**, **220**, and **222**. It is noted that, although the same MTA $\mathbf{110}_X$ may be both the sender MTA and the recipient MTA (e.g., for a message from C@Z.com to D@Z.com the MTA $\mathbf{110}_3$ may be both the sender MTA and the recipient MTA), as used herein, the first time the email message arrives at the MTA $\mathbf{110}_X$ it is considered to have visited the sender MTA and not the recipient MTA—it is considered to have visited the recipient MTA only after returning from custom email handler **116**.

FIG. **2**B illustrates a second example flow of an email message through the system of FIG. **1**. FIG. **2**B differs in that, instead of the custom email handler **116** returning the message to the sender MTA $\mathbf{110}_1$, it sends the message directly to the recipients' MTAs $\mathbf{110}_2$ and $\mathbf{110}_3$, as indicated by arrows **224** and **226**.

FIG. **2**C illustrates a third example flow of an email message through the system of FIG. **1**. In FIG. **2**C, the flow starts out the same as FIG. **2**A with arrows **202**, **204**, and **206**, but in the case of FIG. **2**C the email message is retrieved from MTA $\mathbf{110}_1$ by the sender MUA $\mathbf{114}_1$. This

may be because the email message was self-addressed to A@X.com or because the email message was bounced back to A@X.com (even though A@X.com was not in the "to:," "cc:" or "bcc:" header fields) as a result of rules applied by the custom email handler **116**.

In an example implementation, communications between the MTAs **110** and the custom email handler **116** use the simple mail transfer protocol (SMTP), communications between the MUAs and the MTAs use the post office protocol **3** (POP3) and/or internet message access protocol (IMAP), and communications between the MUAs **114** and the web server circuitry **122** use hypertext transfer protocol (HTTP). Aspects of this disclosure, however, are not dependent on the use of these protocols and any suitable protocols may be used.

FIG. **3** is a flowchart illustrating an example process performed by a sender MTA, such as $\mathbf{110}_1$ in FIGS. **2**A-**2**C. In block **302**, the sender MTA receives the email message (e.g., indicated by arrow **202** in FIGS. **2**A-**2**C). In block **304**, it determines whether the email message has already been processed by the custom email handler **116**. The determination may, for example, be determined based on one or more fields of the email message's envelope, one or more of the message's header fields, and/or the message body of the email message. In an example implementation, this may comprise looking for one or more header fields added by the custom email handler **116**, which are referred to herein as "from-custom-handler" header fields. If the message has not already been processed by custom email handler **116**, then the process advances to block **308**. In block **308**, the sender MTA adds one or more header fields (referred to here as "to-custom-handler" header fields) that may be used by the custom email handler **116**. In an example implementation, the to-custom-handler header(s) comprise(s) an identifier associated with the sender in a database of the custom email handler **116** and a security key associated with the sender in a database of the custom email handler **116**. The identifier may, for example, be a SHA-1 hash of the sender's domain (e.g., X.com in FIGS. **2**A-**2**C) and the security key may, for example, comprise a random string uniquely associated with the sender, the sender's domain, and/or an authorized group to which the sender belongs. In block **310**, the message is sent to custom email handler **116**. Returning to block **304**, if the message has already been processed by custom email handler **116**, then the process advances to block **306** and the message is sent to the recipient MTA(s).

FIG. **4**A is a flowchart illustrating example in-line processing performed by the customized email handler of FIG. **1**. The process begins with block **402** in which a message is received by the custom email handler **116** from a sender MTA. Next, in block **403**, the custom email handler **116** authenticates the email message. The authentication may, for example, be based on one or more fields of the email message's envelope, one or more of the email message's header fields, and/or the email message's body (which, for SMTP, begins after the first blank line in the email message). In an example implementation, this may comprise checking and/or validating the content of one or more to-custom-handler header fields added by the sender MTA. In block **404**, to-custom-handler header field(s) added by the sender MTA are stripped from the message (for implementations using such header field(s)). In block **406**, the message is parsed to determine whether the email message is intended for multiple recipients. This may comprise, for example, parsing the envelope to detect whether there are multiple "RCPT TO:" fields. If there are not multiple recipients, then the process advances to block **408**. In block **408**, the message is added to a queue to await processing by background email processing circuitry **120**. The process then proceeds to block **410** without waiting for background processing to complete (i.e., background processing is asynchronous with respect to in-line processing shown in FIG. **4**A). In block **410**, customized in-line processing is performed on the message by in-line email processing circuitry **118**. Example details of block **410** are described below with reference to FIG. **5**. Next, in block **412**, the in-line email processing circuitry **118** adds one or more from-custom-handler header field(s) to the message. Next, in block **414**, the message is sent to the sender MTA (e.g., as in FIGS. **2**A and **2**C) or to recipient MTA (e.g., as in FIG. **2**B).

Returning to block **406**, if the message is destined for multiple recipients, the process advances to block **416**. In block **416**, the in-line email processing circuitry **118** determines whether the inbound message is to be repackaged into multiple outbound messages, with each of the outbound messages having a different envelope (e.g., each destined for only a single SMTP recipient). It is noted that, for clarity of description, the message before repackaging is referred to herein as the "inbound message" and the messages after splitting are referred to as "outbound messages," but the inbound and outbound messages may have the same message-id and possibly other commonalities (in some instances an inbound message and its outbound messages may identical other than their envelopes). The determination of block **416** may be based on custom processing rules associated with the inbound message in a database of the custom email handler **116**. The association with the message may, for example, be based on one or more fields of the inbound message's envelope, one or more of the inbound message's header fields, and/or the inbound message's body. For example, rules may be stored per sender, per group-of-senders, per recipient, per group-of-recipients, per domain, per group-of-domains, per IP address, per group of IP addresses, per geographical location, per time of email message transmission or receipt, and/or the like. Any particular rule may determine whether to repackage an inbound message based on one or more fields of the inbound message's envelope, one or more of the inbound message's header fields, and/or the inbound message's body. As just a few non-limiting examples of possible rules for deciding whether to repackage an inbound message: decide whether to repackage the inbound message based on its content type header field (e.g., do not repackage messages with content type multipart); decide whether to repackage the inbound message based on whether it has one or more attachments (e.g., do not repackage messages with attachments); decide whether to repackage the inbound message based on its size (e.g., do not repackage email messages over a certain size); decide whether to repackage the inbound message based on its "to:", "cc:", and "bcc" header fields (e.g., do not repackage messages with more than N (an integer) recipients); and decide whether to repackage the inbound message based on number of recipients and email message size (e.g., do not repackage message if number of recipients multiplied by size of message is above a determined threshold). If the inbound message is not to be repackaged, the process advances to block **408** (described above). If the inbound message is to be repackages, the process advances to block **418**.

In block **418**, the message is repackaged according to repackaging rules associated with the inbound message and/or repackaging rules associated with the outbound messages. As in block **416**, the association of a repackaging rule with the inbound message may, for example, be based on

one or more fields of the inbound message's envelope, one or more of the inbound message's header fields, and/or the inbound message's body. Similarly, the association of a repackaging rule with an outbound message may, for example, be based on one or more fields of the outbound message's envelope, one or more of the outbound message's header fields, and/or the outbound message's body. As just a few non-limiting examples of possible rules for deciding how to repackage an inbound message: decide how to repackage the inbound message based on whether it has one or more attachments (e.g., do not copy the attachments to the outbound messages but instead store the attachment and insert a hyperlink); and decide how to repackage the inbound message based on its "to:", "cc:", and "bcc" header fields (e.g., copy attachments to outbound messages unless there are more than N recipients, in which case store attachments and send link). After repackaging in block **418**, the process advances to block **408** and the remaining blocks **408**, **410**, **412**, and **414**, described above, are performed per outbound message. In this manner, repackaging enables the custom email handler **116** to process the inbound message differently for different recipients.

FIG. **4**B illustrates example details of repackaging an inbound message into multiple outbound messages. Called out as **458** is the inbound message as it arrives at the sender MTA (e.g., along the arrow **202** in FIG. **2**A). The envelope **452** (other components of the message **458** are omitted for clarity of illustration) comprises three recipients: B@Y.com, C@Z.com, and D@Z.com. Called out as **460** is the inbound message as it leaves the sender MTA destined for the custom email handler (e.g., along the arrow **204** in FIG. **2**A). The sender MTA has added the to-custom-handler header field(s) **454**. Called out as **462** is a first outbound message (e.g., along the arrow **206** in FIG. **2**A) resulting from repackaging of the inbound message **460** by the custom email handler **116**. The outbound email message **462** has only a first of the three recipients in its envelope **452**, and has one or more from-custom-handler header fields **456**. Called out as **464** is a second outbound message (e.g., along the arrow **206** in FIG. **2**A) resulting from repackaging of the inbound message **460** by the custom email handler **116**. The outbound email message **464** has only a second of the three recipients in its envelope **452**, and has one or more from-custom-handler header fields **456**. Called out as **466** is a third outbound message (e.g., along the arrow **206** in FIG. **2**A) resulting from repackaging of the inbound message **460** by the custom email handler **116**. The email message **466** has only a third of the three recipients in its envelope **452**, and has one or more from-custom-handler header fields **456**. In this manner, each of the outbound email messages **462**, **464**, and **466** can be processed differently by the custom email handler **116**.

FIG. **5**A is a flowchart illustrating an example implementation of the customized email processing block **410** of FIG. **4**.

In block **502**, the custom email handler **116** parses the envelope of the email message. If the envelope of the email message dictates that no custom processing of the email message is to be performed, then the process advances to block **412** of FIG. **4**. If the envelope of the message dictates some particular custom processing to be performed on the message, then the process advances to block **504** and the custom processing is performed. If the envelope of the message indicates that custom processing of the message is possibly called for, then the process advances to block **506**.

In block **506**, the custom email handler **116** parses the to-custom-handler header field(s) of the email message (which may have been automatically inserted by the sender MTA). If the to-custom-handler header field(s) of the message dictate(s) that no custom processing of the message is to be performed, then the process advances to block **412** of FIG. **4**. If the to-custom-handler header field(s) of the message dictate(s) some particular custom processing to be performed on the message, then the process advances to block **508** and the custom processing is performed. If the to-custom-handler header field(s) of the message indicates that custom processing of the message is possibly called for, then the process advances to block **510**.

In block **510**, the custom email handler **116** parses one or more other header field(s) of the email message. One or more of the other header field(s) (such as "message-id") may comprise text automatically generated by the sender MUA and/or the sender MTA. One or more of the other message header fields, such as the "to:," "Cc:," "Bcc:" and "subject:" header fields, may comprise text entered by a sender of the email message via a compose interface provided by the sender MUA. For example, referring briefly to FIG. **5**B, there is shown a compose interface **552** of a webmail MUA running in a browser window **550**. The MUA puts one or more email addresses entered by the sender (e.g., typed, copy-pasted, selected from a dropdown list, etc.) into interface element **554** into one or more "to:" message header fields of a resulting email message, the MUA puts one or more email addresses entered by the sender into interface element **556** into one or more "Cc:" message header fields of the resulting email message, the MUA puts one or more email addresses entered by the sender into interface element **558** into one or more "Bcc:" message header fields of the resulting email message, the MUA puts text entered by the sender into the interface element **560** into a "subject" message header field of the resulting email message, the MUA puts text entered by the sender into the interface element **562** into the message body of the resulting email message.

Returning to block **510** of FIG. **5**A, if the other message header field(s) of the message dictate(s) that no custom processing of the message is to be performed, then the process advances to block **412** of FIG. **4**. If the other message header field(s) of the message dictate(s) some particular custom processing to be performed on the message, then the process advances to block **518** and the custom processing is performed. If the other message header field(s) of the message indicate(s) that custom processing of the message is possibly called for, then the process advances to block **516**.

In block **516**, the custom email handler **116** parses the message body and/or attachments. If the message body and/or attachment(s) dictate(s) that no custom processing of the message is to be performed, then the process advances to block **412** of FIG. **4**. If the message body and/or attachments dictate(s) some particular custom processing to be performed on the message, then the process advances to block **518** and the custom processing is performed.

In block **510** and/or block **516**, parsing may comprise searching for custom email processing commands entered by the sender of the email message (e.g., via the "compose message" interface of FIG. **5**B). Custom processing commands may have a predefined format defined in a database of the custom email handler **116** such that the custom email handler **116** can reliably distinguish them from other text using, for example, regular expression matching. One example format of custom email processing commands is the hashtag format (i.e., #command). Since MUAs universally (or nearly so) enable a sender to input text in the field

body of the subject field and in the message body of the email message, these two portions of email messages may be where the custom email handler **116** searches for custom processing commands. In an example implementation, the custom processing commands are plain text (e.g., with any desired encoding such as ASCII, UTF-8, UTF-16, etc.) and a subject header field or message body comprising a custom processing command is fully compliant with applicable standards (e.g., RFC 5322)). In this manner, regardless of the MUA a sender is using at any given time, s/he can easily provide custom processing commands to the custom email handler **116** without having to install a specific MUA, and without having to install any add-ons or plugins for his/her existing MUA. This enables providing custom email processing commands from, for example, any web browser in which a webmail MUA is running, and from any native MUA on a PC/tablet/smartphone/etc. (e.g., the "stock" mail client on Android®, iOS®, etc.). In an example implementation, custom processing commands are stripped from messages by the custom email handler **116** before the messages are forwarded on to the sender and/or recipient MTA(s) (such that the recipients are unaware the custom processing commands were ever present).

FIG. **6**A is a flowchart illustrating an example implementation of one of the blocks **504**, **508**, **512**, **518** of FIG. **5**. In block **602**, a rule associated with the envelope, header field(s), and/or message body of the email message calls for the custom email handler to insert a notification object into the message. From block **602**, the process proceeds in parallel to blocks **604** and **608**. In block **604**, the in-line email processing circuitry **118** calculates a uniform resource locator (URL) for a notification object to be inserted into the message. The URL may, for example, be based on the envelope, header field(s), and/or custom-processing command(s) of the message. The URL may comprise, for example, one or more of: a hash of the sender's domain, a hash of the sender's email address; a hash of the body of the message-id header field; a random generator number that is unique (to a desired likelihood) to this particular URL, a value corresponding to the body of the message-id header filed encrypted with a security key that is associated with the sender and/or sender's domain in a database of the custom email handler **116**. Then, in block **606**, the in-line email processing circuitry **118** generates HTML element(s) including the URL calculated in block **604**, and inserts the element(s) into the message's body. After block **606**, the process advances to one of blocks **506**, **510**, **516**, or **412** (depending on whether FIG. **6**A corresponds to block **504**, **508**, **512**, or **518**).

In parallel with blocks **604** and **606** are blocks **608** and **610** (which may take place any time during or after performance of blocks **604** and **606** by the in-line email processing circuitry **118**). In block **608**, background email processing circuitry **120** independently calculates the same URL as calculated in block **604**, described above. In block **610**, the background email processing circuitry **120** prepares to receive a request at the calculated URL. This may comprise associating, in a database of the custom email handler, the calculated URL with content (e.g., an image file) to be served in a response to a received request for the calculated URL. This may also comprise, for example, parsing the email message to extract data from, and/or generate metadata about, the email message, and store such data and/or metadata to the database.

FIG. **6**B illustrates an example implementations of the process of FIG. **6**A in which a notification object is inserted into HTML formatted email message body during in-line processing. As shown, after in-line processing per the process of FIG. **6**A, one or more from-custom-handler header fields **622** has been added to the message, and an HTML element containing the calculated URL has been inserted into the message body **624**. In the example shown, insertion of the notification object is triggered by the custom processing command "#addobject." In another example, the default (for a particular user, group of users, and/or the like) may be to insert the notification but a custom processing command of "#noobject" in a particular email message may prevent insertion of a notification object for that particular message.

FIG. **6**C is similar to FIG. **6**B, but since the message body of the email message was plain text, it has been converted to HTML to support the insertion of the HTML element with the calculated URL.

In an example implementation, custom processing commands may be used to control how and/or when the sender of an email message such as those in FIGS. **6**B and **6**C is notified that one or more recipients has opened the email message. For example, the custom processing command of "#notify" may result in the custom email handler **116** sending a notification email message to the original sender each time the message with notification object is opened. As another example, a custom processing command of "#notifyonce" may result in such a notification email message being sent only on the first opening of a particular email message by a particular recipient. As another example, a custom processing command of "#notifydaily" may result in the custom email handler **116** sending daily summary emails informing the sender about how many times the particular email message was opened, by whom, etc. for the preceding day.

FIG. **6**D is a flowchart illustrating an example implementation of one of the blocks **504**, **508**, **512**, **518** of FIG. **5**. In block **630**, a rule associated with the envelope, header field(s), and/or message body of the email message calls for the custom email handler **116** to remove a notification object from the email message during in-line processing of the email message. In block **632**, the in-line processing circuitry parses the message searching for URLs that match (or not) criteria associated with the message in a database of the custom email handler **116**. The association with the message may, for example, be based on one or more fields of the message's envelope, one or more of the message's header fields, and/or the message's body (e.g., URL search criteria may be stored per sender, per group-of-senders, per recipient, per group-of-recipients, per domain, per group-of-domains, per IP address, per group of IP addresses, per geographical location, per time of email message transmission or receipt, and/or the like). The URL criteria may, for example, be regular expressions and/or substrings that match particular domains, particular sub-domains, particular protocols (e.g., http, https, ftp, etc.) particular HTTP GET parameters, and/or the like. In block **634**, any matching URLs found in the email message (or in particular portions of the email message such its body) are removed.

FIG. **6**E illustrates an example implementations of the process of FIG. **6**D in which a notification object is removed from email message's content during in-line processing of the email message. As shown, after in-line processing per the process of FIG. **6**D, one or more from-custom-handler header fields **622** has been added to the message, and the HTML element containing the URL has been removed. In another example implementation, the HTML element may be replaced with content of the same size (e.g., a URL to an image of size L×W is replaced by another URL to a placeholder image of size L×W, or a hyperlink replaced with

another hyperlink of same number of characters) so as to avoid altering the layout/formatting of the email message.

FIG. **7**A is a flowchart illustrating an example implementation of one of the blocks **504**, **508**, **512**, **518** of FIG. **5**. In block **702**, a rule associated with the envelope, header field(s), and/or message body of the email message calls for the custom email handler **116** to replace content of the email message with one or more secure links to content hosted by the web server circuitry **122**. In block **704**, content is removed from the message and stored to a database of the custom email handler (in storage **108**). In block **708**, the in-line email processing circuitry **118** and/or web server circuitry **122** generate a URL pointing to the stored content. In block **708**, an HTML element including the URL generated in block **706** is inserted into the message. In an example implementation, the HTML element may be a notification object such that, when the hyperlink is clicked, the fact that it was clicked and/or information such as the IP address, geographical location, type of computing device, and/or the like may be logged in a database of the customer email handler. This may be used to determine who has accessed the content (e.g., in the case of the content comprising sensitive information) and to control access to the content. For example, the URL may a one-time use such that, upon the first view the URL is disabled such that the hyperlink no longer points to it. As another example, the content may be "ephemeral" such that the content may only be viewed for a determined amount of time (e.g., a few seconds) and then URL expires such that subsequent request to it return a notice that the content has expired, return a redirect to another URL, and/or the like. Upon expiration, a redirect may trigger that causes the browser to leave the page.

FIG. **7**B illustrates an example implementation of the process of FIG. **7**A in which an attachment to an email message is removed and a hyperlink to a securely hosted copy of the attachment is inserted into the content of the email message. As shown, prior to in-line processing according to the process of FIG. **7**A, the message comprises envelope **720**, header fields **722**, body **724**, and attachment **736**. After in-line processing according to the process of FIG. **7**A, the attachment **726** has been removed and replaced by a hyperlink. As represented by the dashed line **728**, the hyperlink points to the attachment **726** accessible via web server circuitry **122**. When clicked by the user, a browser **730** may open and display the content of the attachment **726**. As indicated by the lock in the address bar of browser **730**, the URL may be a secure URL (e.g., accessible only via https) and the person attempting to view the content may need to provide a previously generated username and password, may need to enter a one-time and/or time-sensitive password sent to the email address to which the message was intended, and/or some other suitable security measure.

FIG. **7**C illustrates an example implementation of the process of FIG. **7**A in which plain text formatted content of an email message is removed and a hyperlink to a securely hosted copy of the plain text content is inserted into the content of the email message. As shown, prior to in-line processing according to the process of FIG. **7**A, the message comprises envelope **720**, header fields **722**, and body **724** containing plan text content. After in-line processing according to the process of FIG. **7**A, the plain text content of body **724** has been replaced by a hyperlink. As represented by the dashed line **728**, the hyperlink points to the plain text content accessible via web server circuitry **122**. When clicked by the user, a browser **730** may open and display the text. As indicated by the lock in the address bar of browser **730**, the URL may be a secure URL (e.g., accessible only via https) and the person attempting to view the content may need to provide a previously generated username and password, may need to enter a one-time and/or time-sensitive password sent to the email address to which the message was intended, and/or some other suitable security measure. In another example implementation, the content may be converted to an image file (e.g., .gif, .jpeg. etc.) or video file (e.g., .mov, .flv, etc.) or audio file (e.g., .mp3, using text-to-speech), and then insert an HTML element (<img>, <video>, <audio> etc.) that the MUA can download and display natively without the user having to click a link and open a browser. In an example implementation, a database record of each email recipient may be accessed to see the type of device they typically use to view their email messages (e.g., desktop, tablet, or smartphone) and the image may be size appropriately based on that. Similarly, multiple images of different sizes corresponding to the recipients' various devices may be generated and hosted by the web server. The email message may then have links indicating which link to use depending on which device s/he is reading the email message on.

Similar to FIGS. **7**B and **7**C, HTML content (rather than plain text) may be hosted and replaced by a hyperlink. Also, the entire body need not be replaced. It may be that only sensitive text, images, etc. (e.g., containing information protected by HIPAA, social security numbers, and/or the like) are replaced by hyperlinks. In this regard, the process of FIG. **7**A may be triggered by learning algorithms detecting information that is potentially sensitive.

FIG. **7**D is a flowchart illustrating an example implementation of one of the blocks **504**, **508**, **512**, **518** of FIG. **5**. In block **752**, a rule associated with the envelope, header field(s), and/or message body of the email message indicates to the custom email handler **116** that a sender of an email message, such as the email messages of FIGS. **7**B and **7**C, desires to recall the message. In block **754**, the custom email handler **116** instructs the web server circuitry **122** to move, delete, and/or change permissions for the content associated with one or more URLs in the recalled message.

FIG. **7**E illustrates an example implementations of the process of FIG. **7**D. FIG. **7**E shows a later message ("Recall message") attempting to recall an earlier message ("to-be-recalled message") Prior to the recall message being processed according to FIG. **7**D, it comprises envelope **762**, header fields **764**, and body **766**. In the example implementation, the custom email handler **116** is triggered to perform the process of FIG. **7**D by the presence of the custom processing command "#recall" in the subject header field of the recall message. The custom handler may identify the to-be-recalled message based on one or more fields of the recall message's envelope, one or more of the recall message's header fields, and/or the recall message's body. For example, the recall message may be a forward or reply to the to-be-recalled message, and the custom email handler may identify the to-be-recalled message based on a "reply-to" header field of the recall message matching a header of the to-be-recalled message, based on similarity between the subject header fields of the two messages, based on a message-id header field in the recall message matching a message-id of the to-be-recalled message, and/or the like. After processing according to FIG. **7**D, the recall message comprises a message informing the recipients that access to the URL has been revoked, changed, etc. The recall message may be sent to one or more recipients of the to-be-recalled message. For example, the recall message may be destined to only a subset of the recipients of the to-be-recalled message; access may be revoked/changes/etc. for only that

subset of recipients, and only that subset of recipients may receive the message notifying them of the change. Additionally, or alternatively, the recall message may be sent back to the original sender (e.g., the custom email handler may automatically bcc: the original sender during processing according to FIG. **10**A) in order to confirm to the sender that his/her recall message has been received and the corresponding custom processing has been carried out.

FIG. **8**A is a flowchart illustrating an example implementation of one of the blocks **504**, **508**, **512**, **518** of FIG. **5**. In block **802**, a rule associated with the envelope, header field(s), and/or message body of the email message calls for the custom email handler **116** to replace any URLs found in the email message with corresponding notification URLs. In an example implementation, request a notification URL may be redirected by web server circuitry **122** to its corresponding original URL after web server circuitry **122** logs information about the request. In another example implementation, the web server circuitry **122** may download the content from the original URL, store it locally, and then serve the local copy in response to the request. In block **804**, the message (e.g., in its entirety or specific portions such as its subject header field and message body) is parsed in search of HTML elements (e.g., <a>, <img>, <video>, etc.) which contain URLs. In block **806**, for each of the URL(s) found during the search of the email message ("original URL(s)"), a corresponding notification email message is generated (e.g., based on the envelope, header field(s), custom processing commands, and/or original URL) and associated with the original URL in a database record of the custom email handler **116**. The record may comprise other fields populated during in-line processing (e.g., the message's subject, its recipients, its sender, its content, etc.) and/or may comprise one or more fields (e.g., time of access, geographical location from which accessed, MUA or browser from which accessed, and/or the like) to be populated by the web server circuitry **122** upon receiving a request for the notification URL. In block **808**, the original URLs are replaced with the notification URLs in the message.

FIG. **8**B is a flowchart illustrating an example implementation of one or more of the blocks of FIG. **5**. As shown, the message comprises an envelope **822**, header fields **824**, and body **826**. Prior to in-line processing according to FIG. **8**A, the body an <a> element having a URL of "http://Original.URL", after processing according to FIG. **8**A, the URL of the <a> element has been replaced by "http://notification/URL."

FIG. **9** is a flowchart illustrating an example process performed by a web server of the network of FIG. **1**. The process of FIG. **9** may take place after a recipient of an email message processed by custom email handler **116** submits a request to web server circuitry **122** (e.g., upon opening the email message or actively selecting to download content of the email message and/or entering a URL present in the email message into a web browser). In block **902**, web server circuitry **122** receives a request from a client device for a particular notification URL. In block **904**, the web server circuitry **122** parses the notification URL to extract information uniquely associating the URL with one or more records in one or more databases of the custom email handler. In block **906**, the web server updates one or more fields (e.g., time of access, geographical location from which accessed, number of times accessed, IP addresses from which accessed, MUA or browser from which accessed, and/or the like) of the one or more database records based on content of the request. In block **908**, the web server circuitry **122** uses the database record(s) to serve a response to the client device. For example, the web server circuitry **122** may redirect the client device to a URL in the one or more database records. As another example, the web server circuitry **122** may send the client content identified by the one or more database records.

FIG. **10**A is a flowchart illustrating an example implementation of one of the blocks **504**, **508**, **512**, **518** of FIG. **5**. In block **1002**, a rule associated with the envelope, header field(s), and/or message body of the message calls for the custom email handler **116** to send a message ("return message") back to the sender of a received email message. In block **1004**, the custom email handler **116** determines content to be included in the return message based on one or more fields of the inbound message's envelope, one or more of the inbound message's header fields, and/or the inbound message's body. This may comprise, for example, looking up a database record associated with the inbound message and retrieving content from the database record and/or executing one or more lines of code (e.g., a PHP script previously provided by the sender of the message and validated by the operator of the custom email handler **116**) called for by the database record where output generated during the execution of the one or more lines of code is the content to be included in the return message. In block **1006**, the content generated and/or retrieved in block **1104** is inserted into the body of the message.

FIG. **10**B illustrates an example implementations of the process of FIG. **10**A in which content of the return message provides information about custom processing commands available to the sender. In this example, the message comprises a custom processing command "#help" (merely an example—other formats and/or text for the same command are of course possible) which causes a return message whose content (either an HTML-formatted document, plain text, or attachment) provides a listing of custom email processing commands available for the sender to use in his/her email messages. In this manner, the sender does not need to keep a copy of the available commands on his device or stored in his inbox, and has quick access to the list of commands even when using a temporary client device (e.g., when logged into webmail from a computer in a hotel lobby, from someone else's smartphone, etc.). Furthermore, the sender can be assured he has the list of latest commands which may be occasionally updated by a network administrator, etc.

FIG. **10**C illustrates an example implementation of the process of FIG. **10**A in which content of the return message provides a list of email message templates available to the sender. In this example, the message comprises a custom processing command "#listtemplates" (merely an example—other formats and/or text for the same command are of course possible) which causes a return message whose content (either an HTML-formatted document, plain text, or attachment) provides a listing of email message templates available for the sender to use in his/her email messages (example templates and use thereof is described below with reference to FIGS. **12**A-**12**C). In this manner, the sender does not need to keep a copy of the templates on his device or stored in his inbox, and has quick access to them even when using a temporary client device (e.g., when logged into webmail from a computer in a hotel lobby, from someone else's smartphone, etc.). Furthermore, the sender can be assured he has the latest templates which may be occasionally changed by a network administrator, etc.

FIG. **10**D illustrates an example implementation of the process of FIG. **10**A in which content of the return message is an attachment that triggers an action by an application on the device from which the return email message is opened.

In the example shown, the action is the addition of a task to a task list. That is, the sender sends an email message with the custom processing command #Outlooktask which triggers the process of FIG. **10**A. During the process of **10**A, the custom email handler **116** parses the email message for the #taskcontent command and uses that command generate the task file (e.g., a .pst file for Outlook) before being attached to the return message. Other examples besides a task list include calendar appointments, alarm settings, executables, and/or the like.

In another example implementation of the process of FIG. **10**A, a custom processing command may request a file stored in storage **108**, and the custom processing performed by the custom email handler **116** may comprise retrieving the file (e.g., indicated by a #filename custom processing command in the subject header field or message body), and attaching the file to the email message or providing a URL to the file. The URL may be a secure URL (e.g., accessible only via https) and the person attempting to view the content may need to provide a previously generated username and password, may need to enter a one-time and/or time-sensitive password sent to the email address to which the message was intended, and/or some other suitable security measure. Similarly, the URL may a one-time use such that, upon the first view the URL is disabled such that the hyperlink no longer points to the file.

FIG. **10**E illustrates an example implementation in which a user can perform configuration/administration of the custom email handler via custom processing commands in an email message. In the example shown, an "#admin" custom processing command triggers the custom email handler to execute one or more scripts for configuring the in-line email processing circuitry **118**, the web server circuitry **122**, the background email processing circuitry **120**, and/or for storing data to and/or retrieving data from a database of the custom email handler **116**. In an example implementation, the body of the email message may contain, or contain references to, the commands or scripts to be executed. For security, the custom email handler **116** may, for example, only accept the #admin command from particular senders and the commands or scripts to be executed may be encrypted. In an example implementation, such a command may be used to, for example, add a user (e.g., identified by email address) to a database of the custom email handler **116**, configure the custom processing rules being applied for a particular user (or domain etc.) (e.g., temporarily suspend the application of one or more custom processing rules for a particular sender/recipient/etc.), run reports on usage of the custom email handler **116**, obtain message notification statistics, and/or the like.

In another example implementation of FIG. **10**A, a custom processing command may trigger execution of a script which posts content to a third part web site or service. For example, the custom processing command #post in the subject header field may trigger a post to a social network site, with content of the email message being the content of the post. The email message may then be modified to be a confirmation that the post has been submitted.

In another example implementation of FIG. **10**A, a custom processing command may trigger execution of a script which causes a follow-up email message to be auto-generated if the original email message is not opened or replied-to in some determined amount of time (e.g., #followup1week may set the time to one week). The email message may then be modified to be a confirmation that the follow-up has been scheduled.

FIG. **11** is a flowchart illustrating an example implementation of one of the blocks **504**, **508**, **512**, **518** of FIG. **5**. In block **1102**, a rule associated with the envelope, header field(s), and/or message body of the email message calls for the custom email handler **116** to send (or bounce) a message only if one or more conditions associated with the email message are true (or not). In block **1104**, the message is parsed to determine whether it meets one or more conditions. Example conditions include: whether an intended recipient of the message has opened previous messages (from the sender and/or other senders such as coworkers) within a recent determined time period, whether an intended recipient of the message is known (or suspected) to be blocking notification objects, whether another account in sender's domain (e.g., coworker) has already sent a message to the intended recipient of the message, and/or the like.

FIG. **12** is a flowchart illustrating an example implementation of one of the blocks **504**, **508**, **512**, **518** of FIG. **5**. In block **1202**, a rule associated with the envelope of an inbound message, header field(s) of the inbound message, and/or message body of the inbound message calls for the custom email handler **116** to generate content of a corresponding outbound message from a template. In block **1204**, a template identified by the rule is retrieved from a database of the custom email handler **116**. In block **1206**, one or more placeholders in the template are replaced with custom content extracted from the inbound message (e.g., identified through substring and/or regular expression matching). In block **1208**, the template with customized content is inserted into the body of the outbound message.

FIGS. **12**B and **12**C illustrate an example implementation of the process of FIG. **12**A. FIG. **12**B shows an example "template **1**" having placeholders "#greeting", "#customtext", and "#closing". The template is stored to a database in custom email handler **116**. FIG. **12**C illustrates use of this template to generate an email message. As shown, the inbound message comprises the "#template **1**" custom processing command in its header fields and content for the "#greeting" "#customtext" and "closing" placeholders in its body. Processing per FIG. **12**A results in the body **12**C being populated with the contents of the template with the placeholders replaced with the text in the inbound message. In this manner, the sender has to type very little into the message (ideal if sending from a smartphone, for example) and the result is a lengthy, well-formatted email message according to a previously defined and approved template.

FIGS. **13**A-**13**C illustrate handling of email messages with blind carbon copy recipients, in accordance with an example implementation of this disclosure. For email messages to multiple recipients (particularly if those recipients are at different domains), and for messages having bcc recipients, a sender MTA may send multiple copies of the same email message (e.g., one copy to each domain present in the list of recipients) to the custom email handler **116**. Accordingly, the custom email handler **116** may receive multiple copies of the same email message, but with different envelopes. The process of FIG. **13**A illustrates an example process for reconciling these multiple copies before exporting data about the email message to one or more third-party databases. In block **1302**, the custom email handler **116** receives a first copy of a particular message. In block **1304**, a data export timer starts counting. In block **1306**, data extracted from and/or metadata generated about the particular message is stored to one or more records in one or more databases of the custom email handler **116**. As show by blocks **1308** and **1310**, the custom email handler **116** monitors for additional copies of the same particular

message until the export timer reaches a predetermined time (e.g., 10 minutes). Each time another copy of the same particular message is received, the database records are updated (block **1306**). When the timer expires, the process advances to block **1312** and the data and/or metadata stored in block **1306** is exported to one or more third party databases (e.g., a customer relationship management database of a company associated with the domain from which the particular message originated). In this manner, redundant exports of data and/or exports of incomplete data are reduced.

For example, referring to FIGS. **13**B-**13**C, a message has the following recipients in its header fields **1320**: to:B@X.com, C@X.com; cc:D@Y.com, E@Y.com; bcc: F@Z.com, G@Z.com. The sender MTA $\mathbf{110}_1$ sends accordingly sends this to the custom email handler **116** four times. The first message **1352** is destined for "to:" and "cc:" recipients in domain Y.com, as shown in its envelope **1360**. The second message **1354** is destined for "to:" and "cc:" recipients in domain Y.com, as shown in its envelope **1360**. It should be noted that the headers of the messages **1352** and **1354** do not show the "bcc:" recipients (as is the point of the "bcc:" header). The second message contains the same information as the first message and thus there may be nothing to update in the database(s). The third message **1356** provides the additional information that the message **1302** was sent "bcc:" to F@Z.com. Similarly, the fourth email message **1358** provides the additional information of that message **1302** was sent "bcc:" to G@Z.com. After receiving all four of the messages, the custom email handler **116** knows all the recipients of the message **1302**. Accordingly, if all four are received before the export timer expires, only one export to ant particular third-party database will be needed to ensure the third-party database has the full recipient information for message **1302**.

FIG. **14**A illustrates a third example flow of an email message through the network of FIG. **1**. In FIG. **14**A, MUA $\mathbf{114}_1$ sends (represented by arrow **1402**) an email message to sender MTA $\mathbf{110}_1$. For purposes of illustration it is assumed the email message is from A@X.com to B@Y.com. MTA $\mathbf{110}_1$ determines that the message is to be processed by custom email handler **116** (e.g., because the owner of X.com is a customer of the operator of the custom email handler and has instructed sender MTA $\mathbf{110}_1$ to do as much). The message is thus sent (represented by arrow **1404**) to custom email handler **116**. The custom email handler **116** performs custom processing of the message for X.com and then sends it (represented by arrow **1406**) to MTA $\mathbf{110}_1$. MTA $\mathbf{110}_1$ then sends (represented by arrow **1408**) the message to MTA $\mathbf{110}_2$. MTA $\mathbf{110}_2$ determines that the message is to be processed by custom email handler **116** (e.g., because the owner of Y.com, is a customer of the operator of the custom email handler and has instructed MTA $\mathbf{110}_1$ to do as much). The message is therefore sent (represented by arrow **1410**) to custom email handler **116**. The custom email handler **116** performs custom processing of the message for Y.com and then sends it (represented by arrow **1412**) to MTA $\mathbf{110}_2$. MTA $\mathbf{110}_2$ then sends (represented by arrow **1414**) the message to MUA $\mathbf{114}_2$.

One nuance of the flow of FIG. **14**A is that the custom email handler **116** must be able to distinguish the customer(s) for which it has already processed the message from the customer(s) for which it has not yet processed the message. Otherwise, upon receiving the message from MTA $\mathbf{110}_2$, it may incorrectly determine the email message has already been processed and thus not perform the custom processing requested by Y.com. Furthermore, the custom email handler **116** must be able to distinguish between valid email messages sent by its customers and "spoofed" email messages. In the example implementation of FIG. **14**B, this is achieved through header fields added by the MTAs and the custom email handler. As shown by messages **1404** and **1410** in FIG. **14**B, when sending a message to the custom email handler **116**, each MTA adds a header comprising its customerID and a security key. The customerID may, for example, be a unique string of characters fixed for each customer and the security key may, for example, be a unique string of characters that can be changed occasionally/periodically/etc. As shown by messages **1406**, **1408**, and **1412**, once the custom email handler **116** completes custom processing of a message for a particular client, it adds a header field indicating as much.

In accordance with an example implementation of this disclosure, an email message is received, via network interface circuitry (e.g., **106**) of a custom email handler (e.g., **116**) using the simple mail transfer protocol (SMTP), after the email message has already visited a sender mail transfer agent (MTA) (e.g., $\mathbf{110}_1$). The in-line email processing circuitry of the custom email handler searches a subject header field of the email message and/or a message body of the email message for one or more character strings matching any of a predefined set of custom email processing commands. The search may be triggered and performed automatically (without user intervention) based on predefined instructions/rules (e.g., based on finding the custom processing command in the email message). In response to finding one of the predefined set of custom email processing commands during the search, the in-line email processing circuitry modifies the message body of the email message in accordance with one or more rules associated with the one of the predefined set of custom email processing commands. The modifying may be triggered and performed automatically (without user intervention) based on predefined instructions/rules (e.g., based on finding the custom processing command in the email message). The in-line processing circuitry removes the one of the predefined set of custom email processing commands from the subject header field of the email message and/or the message body of the email message. The removal may be triggered and performed automatically (without user intervention) based on predefined instructions/rules (e.g., based on finding the custom processing command in the email message). After the modification of the message body and the removal of the found one of the custom processing commands, the email message is sent, via the network interface circuitry, into a network destined for a recipient mail transfer agent (e.g., $\mathbf{110}_2$). The sending may be triggered and performed automatically (without user intervention) based on predefined instructions/rules (e.g., based on finding the custom processing command in the email message).

In accordance with an example implementation of this disclosure, the custom email handler may comprise web server circuitry (e.g., **120**), which may receive a request containing a URL previously inserted into an email message by the in-line processing circuitry. In response to the receiving the request, the custom email handler may determine whether to send a notification of the request to a sender of the email message (e.g., to A@X.com in the example of FIG. **2**A) based on whether the email message contained a particular one of the predefined set of custom processing commands (e.g., whether it contained "#notify" or "#nonotify"). The determination of whether to send a request, and sending of the request (if determined to do so) may be

triggered and performed automatically (without user intervention) based on predefined instructions/rules.

In accordance with an example implementation of this disclosure, the in-line email processing circuitry may generate a first uniform resource locator (URL) based on content of the email message. The in-line email processing circuitry may search for and detect, in the body of the message, a second uniform resource locator (URL) that one or both: contains a substring of a set of predefined substrings associated, in a database of the custom email handler, with the one of the predefined set of custom email processing commands; and matches a regular expression of a set of predefined regular expressions associated, in the database of the custom email handler, with the one of the predefined set of custom email processing commands. The modification of the message body of the email message may comprise replacing, in the body of the message, the second URL with the first URL. The generation of the first URL and the search may be triggered and performed automatically (without user intervention) based on predefined instructions/rules. Background processing circuitry of the custom email handler may download content pointed to by the first URL to storage of the custom email handler, wherein the first URL points to the downloaded content in storage of the custom email handler. The downloading may be triggered and performed automatically (without user intervention) based on predefined instructions/rules.

In accordance with an example implementation of this disclosure, the in-line email processing circuitry may search a subject header field of the email message and/or a message body of the email message for a character string containing one or more characters that indicates that the character string is for populating a placeholder in the message template. The searching may be triggered and performed automatically (without user intervention) based on predefined instructions/rules.

In accordance with an example implementation of this disclosure, the in-line email processing circuitry may detect whether the email message comprises an attachment, and in response to the detecting that the email message comprises an attachment: store the attachment to storage of the custom email handler, and generate a uniform resource locator (URL) that points to the attachment stored in the storage of the custom email handler. The detection, storing, and generating may be triggered and performed automatically (without user intervention) based on predefined instructions/rules. The modifying the message body of the email message may comprise removing the attachment from the email message, and inserting a hypertext markup language (HTML) element containing the URL into the message body of the email message.

In accordance with an example implementation of this disclosure, the email message is associated with a uniform resource locator, and the in-line email processing circuitry may perform, in response to the finding of the one of the predefined custom processing commands, one or more of: altering accessibility of content associated with the URL; deleting the content associated with the URL; and associating the URL with content not previously associated with the URL. The altering, deleting, or associating may be triggered and performed automatically (without user intervention) based on predefined instructions/rules.

In accordance with an example implementation of this disclosure, the in-line email processing circuitry may retrieve from storage (e.g., **108**) of the custom email handler, a file identified in the subject header field of the email message and/or the message body of the email message. The retrieving may be triggered and performed automatically (without user intervention) based on predefined instructions/rules. The modifying the message body of the email message may comprises attaching the file to the email message.

In accordance with an example implementation of this disclosure, the in-line email processing circuitry may locate, in storage of the custom email handler, a file identified in the subject header field of the email message and/or the message body of the email message. The in-line email processing circuitry may generate a uniform resource locator (URL) that points to the file in the storage of the custom email handler. The locating of the file and generating of the URL may be triggered and performed automatically (without user intervention) based on predefined instructions/rules. The modifying the message body of the email message may comprises inserting, in the message body of the email message, a hypertext markup language (HTML) element containing the URL.

In accordance with an example implementation of this disclosure, the in-line email processing circuitry may, in response to the finding the one of the predefined set of custom email processing commands during the searching, add one or more message header fields to the email message, wherein the one or more message header fields indicate: the email message has been processed by the custom email handler, and an identifier of a sender for which the email message has been processed by the custom email handler. The adding of the header field(s) may be triggered and performed automatically (without user intervention) based on predefined instructions/rules

As utilized herein the terms "circuits" and "circuitry" refer to physical electronic components (i.e. hardware) and any software and/or firmware ("code") which may configure the hardware, be executed by the hardware, and or otherwise be associated with the hardware. As used herein, for example, a particular processor and memory may comprise a first "circuit" when executing a first one or more lines of code and may comprise a second "circuit" when executing a second one or more lines of code. As utilized herein, "and/or" means any one or more of the items in the list joined by "and/or". As an example, "x and/or y" means any element of the three-element set {(x), (y), (x, y)}. In other words, "x and/or y" means "one or both of x and y". As another example, "x, y, and/or z" means any element of the seven-element set {(x), (y), (z), (x, y), (x, z), (y, z), (x, y, z)}. In other words, "x, y and/or z" means "one or more of x, y and z". As utilized herein, the term "exemplary" means serving as a non-limiting example, instance, or illustration. As utilized herein, the terms "e.g.," and "for example" set off lists of one or more non-limiting examples, instances, or illustrations. As utilized herein, circuitry is "operable" to perform a function whenever the circuitry comprises the necessary hardware and code (if any is necessary) to perform the function, regardless of whether performance of the function is disabled or not enabled (e.g., by a user-configurable setting, factory trim, etc.).

The present method and/or system may be realized in hardware, software, or a combination of hardware and software. The present methods and/or systems may be realized in a centralized fashion in at least one computing system, or in a distributed fashion where different elements are spread across several interconnected computing systems. Any kind of computing system or other apparatus adapted for carrying out the methods described herein is suited. A typical combination of hardware and software may be a general-purpose computing system with a program or other code that, when being loaded and executed, controls the

computing system such that it carries out the methods described herein. Another typical implementation may comprise an application specific integrated circuit or chip. Some implementations may comprise a non-transitory machine-readable (e.g., computer readable) medium (e.g., FLASH drive, optical disk, magnetic storage disk, or the like) having stored thereon one or more lines of code executable by a machine, thereby causing the machine to perform processes as described herein.

While the present method and/or system has been described with reference to certain implementations, it will be understood by those skilled in the art that various changes may be made and equivalents may be substituted without departing from the scope of the present method and/or system. In addition, many modifications may be made to adapt a particular situation or material to the teachings of the present disclosure without departing from its scope. Therefore, it is intended that the present method and/or system not be limited to the particular implementations disclosed, but that the present method and/or system will include all implementations falling within the scope of the appended claims.

What is claimed is:

1. A method comprising:

receiving, by email processing circuitry of a mail transport agent (MTA), an inbound email message;

parsing, by the email processing circuitry of the MTA, the inbound email message to detect that the inbound email comprises a first uniform resource locator (URL) and is intended for multiple recipients;

in response to the detecting;

packaging, by the email processing circuitry of the MTA, the inbound email message into the multiple outbound email messages, where each of the outbound email messages has a different SMTP envelope;

copying, by the email processing circuitry of the MTA, content of the inbound email message to storage of the email processing circuitry;

generating, by the email processing circuitry of the MTA, multiple uniform resource locators (URLs), where each of the multiple URLs is unique among the multiple URLs and targets the content in the storage of the email processing circuitry;

generating, by the email processing circuitry of the MTA, multiple hypertext markup language (HTML) elements each of which comprises a respective one of the multiple URLs;

in each of the outbound messages, replacing, by the email processing circuitry of the MTA, content of the inbound email message with a respective one of the multiple HTML elements;

and

sending, by network interface circuitry of the MTA, the multiple outbound email messages into a network using simple mail transfer protocol (SMTP).

2. The method of claim **1**, wherein each said different SMTP envelope comprises a single recipient email address.

3. The method of claim **1**, wherein each said different SMTP envelope comprises a single recipient domain.

4. The method of claim **1**, comprising, prior to the sending:

generating, by the email processing circuitry, multiple notification objects; and

inserting, by the email processing circuitry, a respective one of the notification objects into the message body of each of the multiple outbound messages.

5. The method of claim **1**, wherein the content comprises an attachment of the inbound email message.

6. The method of claim **1**, wherein the content comprises text and/or an image of a message body of the inbound email message.

7. The method of claim **1**, wherein the content is an image file generated by converting text of a message body of the inbound email message to the image file.

8. A system comprising:

email processing circuitry of a mail transfer agent (MTA), where the email processing circuitry is operable to:

receive an inbound email message;

parse the inbound email message to detect that is intended for multiple recipients and comprises a first uniform resource locator (URL); and

package, in response to the detection, the inbound email message into the multiple outbound email messages, where each of the outbound email messages has a different SMTP envelope;

copy content of the inbound email message to storage of the email processing circuitry;

generate multiple uniform resource locators (URLs), where each of the multiple URLs is unique among the multiple URLs and targets the content in the storage of the email processing circuitry;

generate multiple hypertext markup language (HTML) elements each of which comprises a respective one of the multiple URLs;

replace, in each of the outbound messages, content of the inbound email message with a respective one of the multiple HTML elements;

and

network interface circuitry operable to send the multiple outbound email messages into a network with use of simple mail transfer protocol (SMTP).

9. The system of claim **8**, wherein each said different SMTP envelope comprises a single recipient email address.

10. The system of claim **8**, wherein each said different SMTP envelope comprises a single recipient domain.

11. The system of claim **8**, wherein the email processing circuitry is operable to, prior to the send of the multiple outbound email messages:

generate multiple notification objects; and

insert a respective one of the notification objects into the message body of each of the multiple outbound messages.

12. The system of claim **8**, wherein the content comprises an attachment of the inbound email message.

13. The system of claim **8**, wherein the content comprises text and/or an image of a message body of the inbound email message.

14. The method of claim **8**, wherein the content is an image file generated by converting text of a message body of the inbound email message to the image file.

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